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THE THIRTEENTH IN A SERIES OF 17 VOLUMES, THIS VOLUME PROVIDES THE SEVENTH GRADE TEACHER WITH A GUIDE TO THE REORGANIZED SCIENCE CURRICULUM OF THE MINNEAPOLIS PUBLIC SCHOOLS. THE MATERIALS ARE INTENDED TO BE AUGMENTED AND REVISED AS THE NEED ARISES. THIS SECOND VOLUME 7B, THE SEVENTH GRADE SUPPLEMENT, CONTAINS THE FOLLOWING SECTIONS--(1) BIBLIOGRAPHY, BOOKS, (2) BIBLIOGRAPHY, FILMS, (3) BIBLIOGRAPHY, FILMSTRIPS, AND (4) EQUIPMENT AND SUPPLIES. VOLUME 7A INCLUDES LEARNING EXPERIENCES RELATED TO SCIENTIFIC ATTITUDES AND THE USE OF THE MICROSCOPE. (DH)

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Responsiveness	7	Green
Plants	8	Green
Animals	11	Green
Conservation	22	Green
Human Body	23	Green

The annotations for books found on the following pages were obtained from many bibliographies which were consulted in the preparation of this list.

Introduction to Science

Farmer, Laurence 1962

MASTER SURGEON

Harper. $2.95

Biography. Tells the story of a brilliant and dedicated man who developed the revolutionary concept of antiseptic surgery. This man was Joseph Lister.

Hamilton, Russel 1960

SCIENCE, SCIENCE, SCIENCE

Watts. $2.95

Selections by various authors concerning some of the great events and people of Science. Chronological arrangement.

II. Living Things

A. Life processes of living things -- General

Darling, Lois and Louis 1961

THE SCIENCE OF LIFE

World.	$4.95
(also available in Bantam)	.60

The vast subject of life from single to multicellular organisms is presented with skill, accuracy and clarity. Compares life processes as carried out in various plants and animals. Includes Darwin's and Mendel's contributions. For better seventh grade student.

Fichter, George S. 1960

FISHES AND HOW THEY LIVE

Golden Press.	$1.69

An excellent, well illustrated book which points up the variations among the 30,000 or so kinds of modern fishes: how they swim, breathe, see and survive in shallow and deep water. Very readable.

Herbert, Hiram 1960

WONDER-WORKERS OF THE INSECT WORLD

Dutton.	$3.50

The amazing secrets of the insect world unfold in this book. Here are exciting close-ups of life cycles, the triumphs and tragedies of individual insects representative of different species. This book shows you how and why the insects behave as they do. Effective ink drawings illustrate the book.

Pope, Clifford H. 1962

SNAKES ALIVE AND HOW THEY LIVE

Viking.	$4.50

A very excellent book, interestingly written and well arranged, containing much detailed information about snakes -- how they crawl, how they eat, how they kill their prey, how their venom works, and how to treat snake bites.

II. Living Things

A. Life processes of living things -- Food taking or nutrition

Mickelsen, Olaf 1964

NUTRITION SCIENCE AND YOU

Scholastic Book Services. $.50
(NSTA - Vistas of Science 10)

A century ago, the first nutrition scientists found that changes in diet could save men's lives. Today's scientists carry on that work, striving to learn more about the chemistry of food--and to feed all the earth's people. This book reveals some of the wonders of nutrition. For better students only.

II. Living Things

A. Life processes of living things -- Circulation

Weart, Edith Lucie 1960

THE STORY OF YOUR BLOOD

Coward-McCann $3.00

An easily understood explanation of the circulation and composition of blood and the nature and functions of the red blood cells, white blood cells, plasma and platelets. The last chapter discusses blood groups and blood transfusion. The book is effectively illustrated with clear drawings.

II. Living Things

A. Life processes of living things -- Reproduction and growth

Doering, Harold and Jo Mary McCormick 1964

AN ANT IS BORN

Sterling. $2.99

A very will done work on the life cycle of the ant. Much worthwhile information is given concerning social structure, duties and habits of various types of ants. The many photographic illustrations are excellent.

Gramet, Charles 1962

REPRODUCTION AND SEX IN ANIMAL LIFE

Abelard-Schuman. $3.75

This is a simple, well done treatment of sexual and asexual reproduction in animal life. The development of young of each species is described -- also the role of genes in determining characteristics of offspring. Other topics touched upon are regeneration, courtship, nest, building, etc.

II. Living Things

A. Life processes of living things -- Responsiveness

Cosgrove, Margaret 1961

THE STRANGE WORLD OF ANIMAL SENSES

Dodd, Mead. $3.00

A simple, short and concise study of animal senses. It explains the development of senses up through the various animal groups. It also describes how each creature's senses fit together like pieces of a jigsaw puzzle to equip it for its own unique and intense role.

Gilmour, Ann and James 1964

UNDERSTANDING YOUR SENSES

Warne. $2.95

A simply written book which explains how messages reach us from the outside world through skin, nose, eyes, and ears. It states that stimuli are sorted, interpreted, acted upon and stored away. Included are a number of easy experiments, requiring little equipment, which should interest students and teach them a good deal about the senses.

II. Living Things

Plants

Hylander, Clarence J. 1962

FLOWERS OF FIELD AND FOREST

Macmillan. $3.75

This is a simple taxonomic and ecological approach to the study of wild flowers. Throughout the book specific references are made to the importance of conservation.

Kane, Henry B. 1960

THE TALE OF A POND

Knopf. $3.00

Through the eyes of a boy, we see the full years cycle of life in a pond--swamp area. The inter--relations of life are interestingly illustrated by photographs and drawings.

Miner, Frances M. 1959

THE ADVENTURE BOOK OF GROWING PLANTS

Golden Press. $

This book contains many projects and simple experiments a student can do to find out for himself the facts regarding how plants live and reproduce.

II. Living Things

Plants (continued)

Selsam, Millicent E. 1959

PLANTS THAT HEAL

Morrow. $2.73

Mrs. Selsam tells the story of plants that heal. It includes an account of the plant remedies of primitive societies, a description of plants that have made medical history, and a summary of plants whose ancient medicinal properties are still in use today. It also presents the other side of the picture -- plants that can be poisonous.

Selsam, Millicent E. 1955

THE PLANTS WE EAT

Morrow. $2.75

This book presents the idea that all parts of a plant can serve as food. A food may be any part of a plant -- from flowers to roots; stems to stamens.

U. S. Department of Agriculture 1961

SEEDS

U. S. Printing Office. $2.00

In 75 well-written informative chapters, this unique book presents the complete story of seeds--why seeds are important to you; how seeds develop, travel, rest, grow, and carry life onward; how men produce, improve, clean, store, test, certify, and sell seeds of all kinds; what modern science has learned about the effect on seed production of various factors; what all buyers of seeds should know about seed laws, frauds, good and poor seeds, weeds, and costs.

II. Living Things

Animals

Ames, Gerald and Rose Wyler 1961

THE GIANT GOLDEN BOOK OF BIOLOGY

Golden Press. $3.99

The general topics of biology are presented in a very lively and informative manner and generously illustrated with colorful and meaningful drawings. The life functions of plants and animals, the interrelationships between living things, the various aspects of the human body, growth and development, heredity and genetics, evolution, and the origin of life, are among the subjects discussed. The book is a stimulating introduction to the world of the science of life.

Barnett, Lincoln and Editors of Life 1960

THE WONDERS OF LIFE ON EARTH

Golden Press. $4.95

Darwin's theory wound through such topics as Strange Animal Ancestors, Evolution of Animal Societies, Flightless Birds, Australian Mammals, Heredity, etc. Very readable and excellently illustrated.

Berrill, Jacquelyn 1962

WONDERS OF THE FIELDS AND PONDS AT NIGHT

Dodd, Mead $2.79

An excellent guide to the discovery of animal friends that are apt to be less familiar because they become most active when much of the world is asleep.

II. Living Things

Animals (continued)

Berrill, Jacquelyn 1953

WONDERS OF THE WOODLAND ANIMALS

Dodd, Mead $2.79

This book is an encyclopedic treatment, in story form, of the life cycle of a number of woodland animals. The stories are interesting, short and factual.

Blond, George 1956

THE GREAT MIGRATIONS

Macmillan. $4.00

Apoda the eel, Salar the salmon, and Anser and Anatis, a pair of wild geese, are among the star performers in a book dealing with the phenomenon of migration. In his discussion of the migratory habits of various animals the author uses a highly personalized approach; he not only gives names to many of his non-human characters but in one instance speaks from a lemming's point of view. Such melodramatic mannerisms detract from but do not nullify a work that is both interesting and informative.

Chute, Walter H. 1940

GUIDE TO THE JOHN G. SHEDD AQUARIUM

John G. Shedd Aquarium $1.50

This book is a very comprehensive 236 p. catalog describing the complete exhibits of salt water and fresh water fishes, small tropicals and gold fish, mammals, reptiles, and invertebrates. Several pages are devoted to the operation of the building, collecting of specimens, the extensive water systems and their treatments, etc. The book is profusely illustrated with 249 photographs.

II. Living Things

Animals (continued)

Coates, Christopher W. 1962

TROPICAL FISHES AS PETS

Collier Books $ .95

This book contains much information for the novice, as well as the advanced amateur, about collecting and breeding tropical fishes. With enthusiams, Mr. Coates presents a wealth of material useful to the owner of the smallest goldfish bowl or the largest commercial supply house.

Comstock, Anna Botsford 1957

HANDBOOK OF NATURE STUDY

Cornell $6.75

Although designed primarily as a teaching aid, this nature guide presents its information in a way which makes it interesting to any amateur naturalist.

Cosgrove, Margaret 1961

THE STRANGE WORLD OF ANIMAL SENSES

Dodd, Mead $3.00

A simple, short and concise study of animal senses. It explains the development of senses up through the various animal groups. It also describes how each creature's senses fit together like pieces of a jigsaw puzzle to equip it for its own unique and intense role.

II. Living Things

Animals (continued)

Darling, Lois and Louis 1961

THE SCIENCE OF LIFE

World.	$4.95
(also available in Bantam)	.60

The vast subject of life from single to multicellular organisms is presented with skill, accuracy and clarity. Compares life processes as carried out in various plants and animals. Includes Darwin's and Mendel's contributions. For the better seventh grade student.

Doering, Harold and Jo Mary McCormick 1964

AN ANT IS BORN

Sterling.	$2.99

A very well done work on the life cycle of the ant. Much worthwhile information is given concerning social structure, duties and habits of various types of ants. The many photographic illustrations are excellent.

Fitcher, George 1960

FISHES AND HOW THEY LIVE

Golden Press.	$1.69

An excellent, well illustrated book which points out the variations among the 30,000 or so kinds of modern fishes: how they swim, breathe, see and survive in shallow and deep water. Very readable.

II. Living Things

Animals (continued)

The Fisherman's Encyclopedia Staff 1962

FRESH WATER FISHES

Collier Books. $ .95

This little book presents interesting and useful data about the commonest varieties of fishes found in the lakes and rivers of North America. Information on habitats, feeding habits, identifying them and how best to pursue them will assure the fisherman better sport and greater success.

Gramet, Charles 1962

REPRODUCTION AND SEX IN ANIMAL LIFE

Abelard-Schuman. $3.75

This is a simple, well done treatment of sexual and asexual reproduction in animal life. The development of young of each species is described -- also the role of genes in determining characteristics of offspring. Other topics touched upon are regeneration, courtship, nest building, etc.

Harpster, Hilda T. 1962

THE INSECT WORLD

Viking. $3.50

In fifteen interestingly titled chapters, this book works in a great deal of information about many familiar insects. Without a knowledge of the habits of insects, man is unable to control their destructive habits or fully benefit from their skill and industry. This book provides such knowledge.

II. Living Things

Animals (continued)

Hegner, Robert 1955

PARADE OF THE ANIMAL KINGDOM

Macmillan. $6.75

A very comprehensive nontechnical account of all forms of animal life, from protozoa to man. Each phylum or major class is treated thoroughly with photographs and drawings. Includes information on appearance, structure, habits, defense, diet, reproduction, and effect on man. Despite its age, it continues to hold the interest of persons of all ages.

Herbert, Hiram 1960

WONDER-WORKERS OF THE INSECT WORLD

Dutton. $3.50

The amazing secrets of the insect world unfold in this book. Here are exciting close-ups of life cycles, the triumphs and tragedies of individual insects representative of different species. This book shows you how and why the insects behave as they do. Effective ink drawings illustrate the book.

Huxley, Julian 1958

THE WONDERFUL WORLD OF LIFE

Garden City. $2.95

This is an excellent treatment of evolution with pictures, diagrams and written material.

II. Living Things

Animals (continued)

Kane, Henry 1960

THE TALE OF A POND

Knopf. $3.39

Through the eyes of a boy, we see the full years cycle of life in a pond--swamp area. The inter--relations of life are interestingly illustrated by photographs and drawings.

Lavine, Sigmund A. 1960

STRANGE TRAVELERS

Little, Brown & Co. $2.95

A very complete and interesting book dealing with all types of migration.

Lavine, Sigmund A. 1960

WONDERS OF THE ANTHILL

Dodd, Mead. $2.95

An informative book which describes the anatomy of the ant, the composition of the ant colony, the development of an ant, various types of formicaries, and the behavior of six different kinds of ants such as army ants and Amazon ants. Also discusses old beliefs about ants, noting their usefulness or harmfulness to man and offers suggestions for making an observation nest.

II. Living Things

Animals (continued)

Lobsenz, Norman M. 1962

THE INSECT WORLD

Golden Press. $1.69

The author has selected a number of topics regarding insects and explains them clearly, interestingly and with outstanding illustrations. Examples of the topics discussed are: What an Insect Is, How Insects are Born and Grow, Insect Instinct, Social Insects, Hunters, Music Makers, Disease Carriers, Collecting Insects.

Phillips, Mary Geisler 1960

DRAGONFLIES AND DAMSELFLIES

Crowell. $3.50

In this bright and friendly book, the author first introduces the reader to the science of taxonomy, the system of classification for all living matter. Within this framework she presents the structure of the dragonfly and damselfly -- their life cycle and habits. She describes exactly where to find them, how to identify them and how to collect and preserve them.

Pope, Clifford H. 1962

SNAKES ALIVE AND HOW THEY LIVE

Viking. $4.50

A very excellent book, interestingly written and well arranged, containing much detailed information about snakes -- how they crawl, how they eat, how they kill their prey, how their venom works, and how to treat snake bites.

II. Living Things

Animals (continued)

Hutchins, Ross E. 1959

INSECT BUILDERS AND CRAFTSMEN

Rand McNally $2.95

In a companion volume to his "Insects-hunters and trappers" an entomologist first discusses instinct and intelligence in insects, then describes with enthusiasm the habits behavior, and home-building methods of some of the more interesting insect architects such as the paper hornet, carpenter bee, mud dauber, leaf cutter, caddis worm, and termite. A final chapter offers suggestions for studying these insects at work. Illustrated with fascinating photographs.

Selsam, Millicent E. 1961

UNDERWATER ZOOS

Morrow. $2.75

The author of "How to grow house plants" tells invitingly how to collect aquarium specimens and how to set up and maintain a salt-water aquarium and a fresh-water aquarium. She also offers interesting information about the creatures to be collected and suggests ways to observe and study their behavior. A list of supply houses is appended; satisfactorily illustrated.

Sterling, Dorothy 1960

CREATURES OF THE NIGHT

Doubleday.

This book tells of the world of bugs, beetles and katydids, of moths, crickets and spiders -- the world of all creatures whose activities increase as night falls. It tells of the characteristics, habits and history -- and the simple methods you can use to discover them, too!

II. Living Things

Animals (continued)

Sterling, Dorothy 1960

CATERPILLARS

Doubleday. $2.75

An enticing introduction to caterpillars describes informally the life cycle of a butterfly or moth, the anatomical structure of a caterpillar, its eating habits, silk spinning, enemies, and means of survival. The book also tells how to catch, observe and raise caterpillars. The colored or black-and-white drawings on every page are both informative and decorative.

Teale, Edwin Way 1962

THE STRANGE LIVES OF FAMILIAR INSECTS

Dodd, Mead. $4.00

The author describes how an insect sees, feels, smells, breathes, walks, flies, communicates, sleeps, finds its food -- in short, what it is like to be an insect.

Teale, Edwin Way 1953

THE JUNIOR BOOK OF INSECTS

Dutton. $4.50

A guide book for the collection of insects in story book form. It contains good suggestions on feeding, housing and care of insects or collections of insects.

II. Living Things

Animals (continued)

Tibbets, Albert B. 1952

THE FIRST BOOK OF BEES

Watts. $1.95

This book is a reference for the study of honey bees -- their differences and methods of producing honey. There is a short notation on other types of bees.

U. S. Department of Agriculture 1952

INSECTS, (The Yearbook of Agriculture, 1952)

U. S. Government Printing Office. $2.50

Comprehensive coverage of this field, including, information on useful and harmful insects, and excellent water plates.

Zim, Herbert S. and Hobart M. Smith 1963

REPTILES AND AMPHIBIANS

Golden Press. $2.99

This is an excellent book on identification of many common amphibians and reptiles. It tells of their habits and how they should be cared for in captivity.

II. Living Things

Conservation

Hylander, Clarence 1962

FLOWERS OF FIELD AND FOREST

Macmillan. $3.75

This is a simple taxonomic and ecological approach to the study of wild flowers. Throughout the book specific references are made to the importance of conservation.

Trefethen, Joseph B. 1964

WILDLIFE MANAGEMENT

Heath. $1.32

An excellent approach to what real conservation means. It destroys a lot of myths about conservation.

U. S. Department of Agriculture 1955

WATER

U. S. Government Printing Office $

This is an excellent book on water conservation. It contains much resource material on the sources and uses of water.

U. S. Department of Health, Education and Welfare 1962

THE STRUGGLE FOR CLEAN WATER
(Public Health Service Publication No. 958)

U. S. Government Printing Office $ .15

This contains good supplementary information on water pollution for teacher reference. It handles the problem of water pollution in a concise, but complete manner.

II. Living Things

Human Body

Gilmour, Ann and James 1964

UNDERSTANDING YOUR SENSES

Warne. $2.95

A simply written book which explains how messages reach us from the outside world through skin, nose, eyes and ears. It states that stimuli are sorted, interpreted, acted upon and stored away. Included are a number of easy experiments, requiring little equipment, which should interest students and teach them a good deal about the senses.

Weart, Edith Lucie 1960

THE STORY OF YOUR BLOOD

Coward-McCann. $3.00

An easily understood explanation of the circulation and composition of blood and the nature and functions of the red blood cells, white blood cells, plasma and platelets. The last chapter discusses blood groups and blood transfusion. The book is effectively illustrated with clear drawings.

A TABULATED BIBLIOGRAPHY OF APPROVED TEXTBOOKS
Correlated to Junior High Science Content

7th Grade Topics 7th Grade Texts	Introduction to Science	Plants	Animals	Conservation	Human Body	*Health	Water	Air
Basics								
Lippincott Smith and Jones - '59 Exploring Modern Science	1- 11	268-282	282-301	302-332		132-175	44- 73	12-43
Allyn-Bacon Smith - '60 Our Environment:Its Relation To Us	XI-XIII				334-399	400-427	216-239	1- 85
Holt, etc. Davis, et al - '59 Science 1-Observation and Experiment	1- 29	304-343		344-377		244-303	66- 89	
Supplements								
American Book Jacobson et al - '59 Adventures in Science		278-319	278-291 320-361			238-277		
Holt, etc. Fitzpatrick et al-'62 Living Things		114-181	182-273		274-397			
Prentice-Hall Ames et al - '56 Science in Today's World	4- 31				84-103	2- 83 104-129	130-173	228-246
Scott Foresman Beauchamp et al - '57 Science Problems One		32- 35 56- 77 260-287 326-367	32- 55 67- 77 260-287 326-367		288-325			
Harcourt-Brace Brandwein et al- '60 You and Your World	4- 18 333-338 393-452	279-300	301-317		67-214	19- 66		215-256

*Health content is not to be taught in 7th grade science. However, many of the textbooks mix up the structure and function of the human body, which is to be taught in 7th grade science, with health content, which is to be taught in 9th grade health. The pages on health are included in this bibliography, but should only be used with great discretion.

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1-29-62

A TABULATED BIBLIOGRAPHY OF APPROVED TEXTBOOKS
Correlated to Junior High Science Content

7th Grade Topics 8th Grade Texts	Plants	Animals	Human Body	*Health	Water	Air	Conservation
Basics							
Lippincott Smith and Jones - '59 Enjoying Modern Science	377-445	377-411		100-135	136-175		514-560
Allyn & Bacon Smith - '60 Our Environment: How We Adapt Ourselves to It	454-513			368-453			
Holt, etc. Davis et al - '58 Science Two-Experiment and Discovery	197-233	234-309	310-345	346-415			
Supplements							
American Book Jacobson et al - '59 Broadening Worlds of Science	388-426	388-426	161-225	226-283	56- 99		409-439
Heath Fletcher and Wolfe - '59 Earth Science						322-351	503-523
Prentice-Hall Ames et al - '56 Science for Your Needs	48- 60 258-270 288-301	258-265 270-287 288-301		61- 72 88-125	52- 60	61-72	73- 87
Scott Foresman Beauchamp et al - '57 Science Problems Two	344-374	344-347 374-387	292-343				388-431
Harcourt Brace Brandwein et al - '60 You and Your Inheritance	125-166			29- 74			
Van Nostrand Namowitz and Stone - '60 Earth Science						414-451	

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Correlated to Junior High Science Content

7th Grade Topics 9th Grade Texts	Plants	Animals	Human Body	Health*	Water	Air	Conservation
Basics							
Van Nostrand Obourn et al - '58 Science in Everyday Life	371-392 405-424	371-383 392-404 405-424	454-465	425-453 466-499	59- 80	27- 58	501-557
Scott-Foresman Beauchamp et al - '58 Science Problems Three	452-493	452-493	356-405	406-451			
Holt Davis et al - '61 Science Three-Discovery and Progress	496-529		530-561		150-199	26- 57	
Supplements							
Rand-McNally Gilman and Van Houten - '57 General Science Today	484-499	484-492 500-519	520-553		114-153	154-187	554-609
Holt Brooks and Tracy- '54 Modern Physical Science				358-377	64-111	22- 37 52- 63	
Allyn and Bacon Van Hooft - '56 Our Environment: How We Use and Control It	33- 34 35- 48 503-524 639-666	27- 32 35- 48 639-666	567-590	543-566 591-638	171-206	141-156	525-542
Van Nostrand Hogg et al - '59 Physical Science					215-223	20- 29	
Ginn Curtis and Mallinson - '58 Science in Daily Life	360-386 396-410	360-373 387-410	411-440	441-462	47- 85	15- 46	463-495
Lippincott Smith and Jones - '59 Using Modern Science	510-611	510-611	214-266	267-315	30- 35	20- 30	73-121 611-618
Harcourt-Brace Brandwein et al - '60 You and Science	350-384 385-433	385-433	54- 99	100-131			371-384
Prentice-Hall Ames, et al - '56 Science for Progress	75- 89 461-493	75- 89 461-493	58- 74	114-179	403-417	497-509	90-113 527-554
Civil Air Patrol, Inc. Civil Air Patrol Pamphlets							

*Health content is not to be taught in 7th grade science. However, many of the textbooks mix up the structure and function of the human body, which is to be taught in 7th grade science, with health content, which is to be taught in 9th grade health. The pages on health are included in this bibliography, but should only be used with great discretion.

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MINNEAPOLIS PUBLIC SCHOOLS
Science Department

BASIC SCIENCE EDUCATION SERIES USEFUL IN JUNIOR HIGH SCHOOL SCIENCE
(Reading difficulty determined by Winnetka Scale)

GRADE SEVEN

Introduction to Science

The Scientist and His Tools - 4.5
Superstition or Science - 5.8

Plants

Adaptation to Environment - 5.1
An Aquarium - 2.7
Balance in Nature - 6.3
Dependent Plants - 3.7
Domesticated Plants - 6.6
Flowers, Fruits, Seeds - 3.8
The Garden and Its Friends - 3.7
Gardens Indoors - 3.3
Leaves - none*
Living Things - 2.9
Pebbles and Sea Shells - 3.0
Plant and Animal Partnerships - 3.3
Plant Factories - 3.9
The Plant World - 6.5
Plants Round the Year - 2.8
Seeds and Seed Travels - 3.3
Trees - 4.5
Useful Plants and Animals - 3.2
Watch Them Grow Up - 2.0

Water

Water - 4.1
Water Appears and Disappears - 2.6
Water Supply - 5.8

Animals (including human body)

Adaptation to Environment - 5.1
An Aquarium - 2.7
Animal Travels - 3.8
Animal World - 6.6
Animals and Their Young - 2.1
Animals of the Seashore - 3.8
Animals Round the Year - 3.3
Animals That Live Together - 1.9
Animals We Know - 4.2
Balance in Nature - 6.3
Birds - 3.8
Birds in the Big Woods - 2.1
Birds in Your Back Yard - none*
Domesticated Animals - 6.6
Fishes - 3.8
How Animals Get Food - 3.0
How We Are Built - 6.3
Insect Friends and Enemies - 5.6
The Insect Parade - 3.1
Insect Societies - 6.5
Insects and Their Ways - 4.8
Living Things - 2.9
Plant and Animal Partnerships - 3.3
Pebbles and Sea Shells - 3.0
The Pet Show - 3.2
Reptiles - 3.9
Saving Our Wildlife - 3.3
Six-Legged Neighbors - none*
Spiders - 3.4
Toads and Frogs - 3.2
Useful Plants and Animals - 3.2
Watch Them Grow Up - 2.0
You As a Machine - 5.4

Air

The Air About Us - 3.5
Fire - 4.1
Fire, Friend and Foe - 5.7
Our Ocean of Air - 4.1

*Vocabulary correlated with the Alice and Jerry Basic Readers.

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GRADE EIGHT

Introduction to Science

The Scientist and His Tools - 4.5
Superstition or Science - 5.8

Weather and Climate

Ask the Weatherman - 5.9
Clouds, Rain and Snow - 3.5
Pebbles and Sea Shells - 3.0
Water Appears and Disappears - 2.6
Ways of the Weather - 4.9

Geology

Animals of Yesterday - 4.5
The Earth A Great Storehouse - 4.9
The Earth's Changing Surface - 5.0
Life Through the Ages - 5.2
Pebbles and Sea Shells - 3.0
Soil - 5.1
Stories Read From the Rocks - 3.3

Astronomy

Beyond the Solar System - 5.4
The Earth's Nearest Neighbor - 4.1
How the Sun Helps Us - 2.4
The Sky Above Us - 3.5
The Sun and Its Family - 4.2

GRADE NINE

Introduction to Science

The Scientist and His Tools - 4.5
Superstition or Science - 5.8

Energy from Matter

Matter, Molecules and Atoms - 5.6
Water Appears and Disappears - 2.6
What Things are Made Of - 4.3

Energy, Force and Motion

Doing Work - 3.4
Gravity - 3.2
Machines - 3.2
Rockets and Missiles - 10**

Electrical Energy

Electricity - 4.1
Magnets - 2.7

Common Forms of Wave Energy

Heat - 5.1
Light - 4.5
Sound - 4.7
Thermometers, Heat and Cold - 3.8

Nuclear Structure and Sources of Energy

The Everyday Atom - 8.0

Aerospace

Satellites and Space Travel - 9**

**Reading difficulty determined by Dale-Chall formula.

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TREES OF MINNESOTA

MINNESOTA DEPARTMENT OF CONSERVATION

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TREES OF MINNESOTA

HOW TO KNOW THEM

A POCKET MANUAL

Third Revised Edition

Chester S. Wilson, *Commissioner*
Department of Conservation
St. Paul, Minnesota

1950

Foreword

Economically, trees are indispensable. Without them Minnesota would not be a land of some 11,000 lakes and 550 streams. Trees enter directly or indirectly into every phase of our life and activity. That is why an acquaintance with the trees of our state goes beyond a pleasant experience to an obligation.

An informed public opinion is of immeasurable importance for the proper appreciation and care of our trees. It can also be a directing force in the wise management of our woodlands.

The Division of Forestry, Minnesota Department of Conservation, is charged with the administration of our forest resources. One hundred and sixty state rangers are available at all times for forest protection and reforestation activities. They stand ready to assist you with any forestry problem.

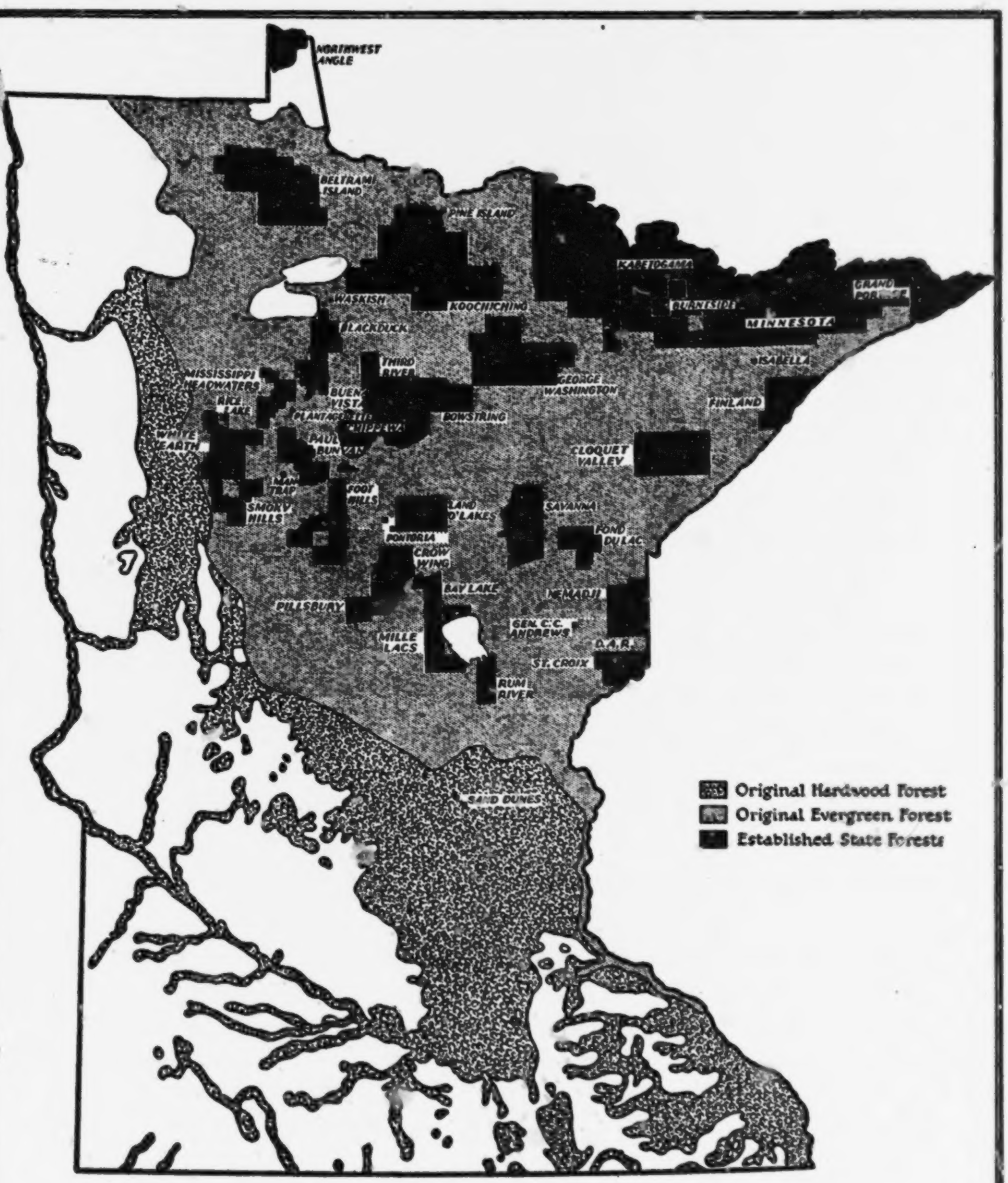
Trees are a perpetual living resource. They are a "crop," not irreplaceable timber. Properly managed forests can be made to last forever.

Our forests provide work for some 50,000 to 70,000 Minnesota citizens. There are over a thousand forest product manufacturing plants in our state. Scientific investigations into the uses of wood and its by-products are continually expanding these industries.

This little booklet is a simple introduction to but 50 of our most common forest trees—trees that have many functions: in addition to their utility they beautify the landscape, hold soil moisture, prevent erosion, break the wind, purify the air, aid flood control, shelter wildlife—they even provide sanctuaries for the human spirit.

Learn to identify trees. Carry this manual with you on your out-of-door rambles. Soon you will take a personal interest in the management of your forests and trees will continue to remain the priceless heritage of future generations.

Clarence Prout, Director,
Division of Forestry


NORTHWEST ANGLE
BELTRAMI ISLAND
PINE ISLAND
KABETOGAMA
GRAND PORTAGE
BURNTSIDE
MINNESOTA
WASKISH
KOOCHICHING
BLACKDUCK
ISABELLA
THIRD RIVER
GEORGE WASHINGTON
MISSISSIPPI HEADWATERS
BUENA VISTA
FINLAND
RICE LAKE
PLANTAGENET
BOWSTRING
CHIPPEWA
WHITE EARTH
PAUL BUNYAN
CLOQUET VALLEY
MAN TRAP
FOOT HILLS
SMOKY HILLS
LAND O'LAKES
SAVANNA
PONTORIA
FOND DU LAC
CROW WING
BAY LAKE
NEMADJI
PILLSBURY
GEN. C.C. ANDREWS
MILLE LACS
D.A.R.
ST. CROIX
RUM RIVER
SAND DUNES
▨ Original Hardwood Forest
▨ Original Evergreen Forest
■ Established State Forests

FOREST MAP OF MINNESOTA

Key for Tree Identification

Conifers (evergreens)

Leaves needle-like or scale-like and persistent.
    Leaves in groups of 2
        ¾ to 1¼ inches long–JACK PINE
        3 to 5 inches long–NORWAY PINE
    Leaves in groups of 5–WHITE PINE
    Leaves in many-leafed clusters on short spur branches–TAMARACK
    Leaves borne singly on branches
        flat and in one plane–BALSAM FIR
        in spirals on twigs–HEMLOCK
        2 leaves pointed and sharp–SPRUCE
    Leaves scale-like and flattened–WHITE CEDAR
    Leaves awl-like, cone berry-like–RED CEDAR

Deciduous Trees (hardwoods)

Leaves compound
    Leaflets 3 to 5–BOX ELDER
    Leaflets 5 to many–ASHES
    Leaflets ½ to 1 inch long, rounded tip–LOCUST
    Leaves 7 to 16 inches long, leaflets strong smelling when crushed–WALNUTS
Leaves simple
    Leaves with lobes and no saw teeth, central veins with smaller side veins–OAKS
    Leaves with long, central stem–MAPLES
    Leaves broad, saw-toothed, base uneven–ELM
    Leaves broad, margin toothed once for each vein–BEECH
    Leaves broad, margin toothed more than once for each vein–IRONWOOD
    Leaves oval and rough, three prominent veins not straight–HACKBERRY
    Leaves finely saw-toothed, smooth, similar to rose leaves–JUNEBERRY
    Leaves usually triangular shaped and broader than long–POPLARS
    Leaves finely saw-toothed, rose-like, branches usually with thorns–PLUM

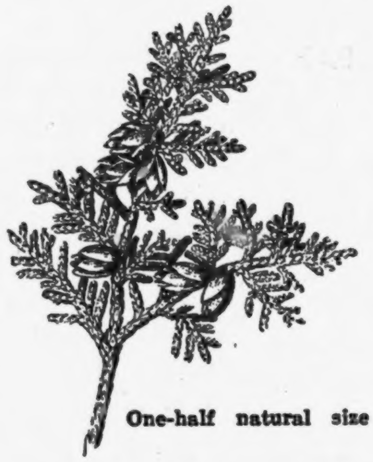
WHITE CEDAR (ARBOR VITAE)

[*Thuja occidentalis*]

FORM Compact, pyramidal; height sometimes 70', diameter 2 to 3'; trunk often twisted, strongly tapered, and frequently divided into two or more direct stems; branches short and nearly horizontal; sometimes forms almost impenetrable thickets, as dead branches are very stiff and persistent; in the open, develops a conical, symmetrical crown. There are numerous ornamental or garden varieties of Arbor Vitae.

BARK Gray to reddish brown, separating in long, vertical, narrow shreddy strips.

LEAF Scale-like; length ⅛ to ¼", arranged to make the small branches flat; pleasant, aromatic scent when crushed; pungent to the taste.



One-half natural size

FRUIT Small, oblong cone ripens in fall of first year; yellowish-brown; size about ½" with six to twelve scales borne singly or in large clusters on ends of branches.

RANGE Native in northern part of state; grows usually in moist places where it is often found in dense pure stands; however, sometimes found on rather stony ground, singly or in small clumps as far south as Winona County.

WOOD Light, soft, brittle, coarse grained, durable, fragrant, and pale brown in color; especially important for making canoes, fence posts, railroad ties, telephone and telegraph poles, and shingles; fruit extracts and tinctures are made from young branchlets.

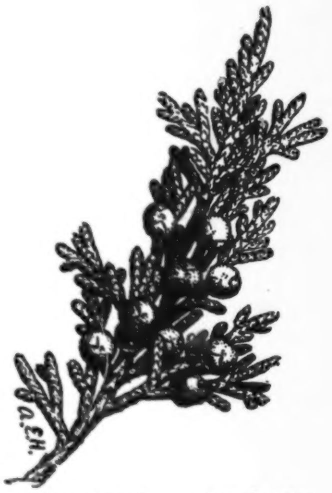
RED CEDAR (JUNIPER)

[*Juniperus virginiana*]

FORM Straight trunk more or less grooved and broad conical head; height 25 to 30′ when growing in good locations; trunk may be very divided or nearly prostrate on poor, rocky, and dry soil.

BARK Thin, reddish brown, peeling off in long, vertical shred-like strips.

LEAF Two kinds usually found on same tree; more common kind is dark green, minute and scale-like, clasping the stem in four ranks so that stem appears square; second kind usually appears on young growth, on vigorous shoots, or on branches in deep shade; are awl-shaped, quite sharp-pointed, spreading, and whitened on under side.



Three-fourths natural size

FRUIT A dark blue berry-like cone; diameter ¼″, enclosing one or two seeds in the sweet flesh; matures in one season; is a favorite winter food for some birds.

RANGE Dry, gravelly soil, and rocky ledges in southern half of state; most abundant on river bluffs in southeastern part where few other trees are found.

WOOD Red, fine-grained, soft, weak, fragrant, and very durable; used for interior woodwork, chests, closets, lead pencils, posts, poles, etc., and oil of red cedar distilled from the leaves and wood. Red Cedar spreads cedar rust of apples; therefore, it is not favorable to plant in or near orchards or anywhere in regions devoted to commercial apple production.

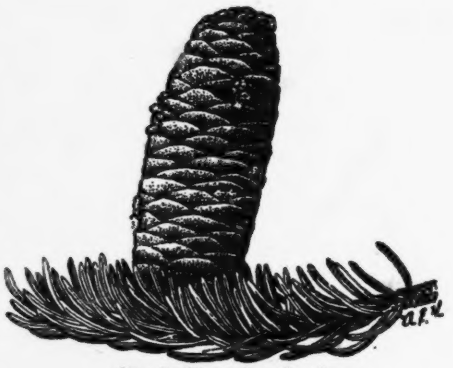
BALSAM FIR

[*Abies balsamea*]

FORM Medium size; height 40 to 80′ with continuous straight tapering trunk from root to top; diameter 9 to 20″ or more; spreading branches form a handsome, symmetrical, slender pyramid.

BARK Smooth, grayish, prominently marked by blisters filled with resin or balsam pitch.

LEAF Needle-like, but flat; length ½ to 1″ with rounded point, dark green and lustrous above and silvery white beneath; arranged on twig apparently in two ranks; resinous and fragrant.



One-half natural size

FRUIT Cones upright on branches, purple, oblong; length 2 to 4″; become ripe in autumn of first year; cone scale wider than long; seeds have very wide wings, and when ripe, fall together with scales of cone, leaving hard central axis standing upright on twig like a spike.

RANGE Found in forests of northern Minnesota and in a few scattered localities in southeastern corner of state; usually associated with white spruce from which it can easily be distinguished by its large upright cones and soft leaves; thrives in cool, damp, or shaded places.

WOOD Light, soft, not strong or durable, coarse grained; used only slightly for construction lumber; is mixed with spruce-wood for paper pulp; especially important as Christmas trees; oil of fir is obtained from bark; not particularly desirable for ornamental planting.

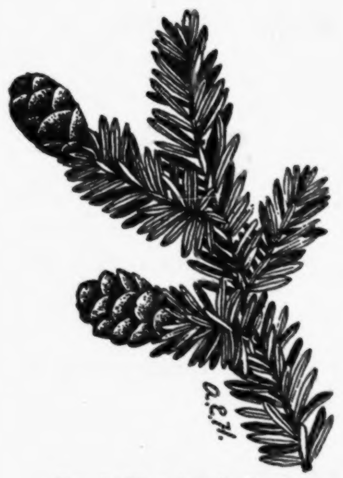
HEMLOCK

[*Tsuga canadensis*]

FORM Height 50 to 75'; trunk straight, upright; branches spreading and nearly horizontal; leading shoot in young trees usually drooping; twigs slender.

BARK One-half to ¾" thick, deeply divided into narrow rounded ridges, covered with thick, closely appressed scales, varying from cinnamon-red to grey.

LEAF (Needles) Length ⅓ to ⅔", width about 1/16"; flat but blunt, scattered and borne in many rows, but usually twisted into a two-rank arrangement; remain on twig for two or three years, but fall rapidly if twig is dried, leaving twigs roughened by woody, raised projections. Most buds are scaly and not resinous.



One-half natural size

FRUIT (Cones) Length ½ to ¾" with scales almost as wide as long; ripens first autumn; opens at maturity and discharges seeds. Seeds are winged, slightly resinous, and about 1/16" long; flowers in spring.

RANGE Usually grows on acid soil containing considerable organic matter; the hemlock barely reaches Minnesota, occuring native in Carlton County just southwest of Lake Superior; also a few scattered trees in Aitkin and St. Louis Counties.

WOOD Light reddish-brown; soft, coarse, brittle, splintering, and not durable; largely manufactured into coarse lumber for outside finish of buildings; inner-bark used for tanning leather; oil of hemlock distilled from young branches.

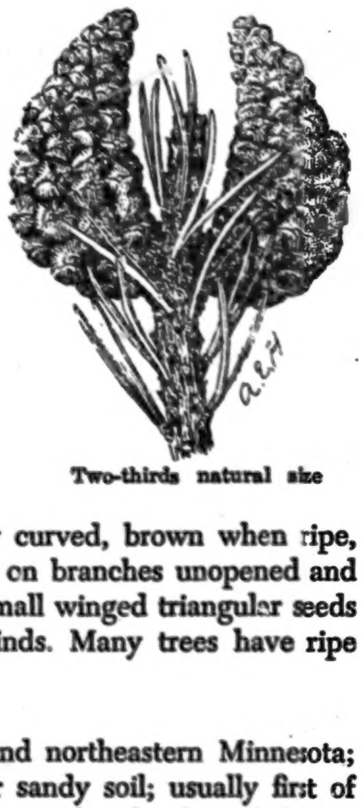
JACK PINE

[*Pinus Banksiana*]

FORM Straight trunk; height 30 to 70′; diameter rarely exceeds 2′; top or crown of spreading branches and scant or open foliage. Small dead branches often remain on trees for many years.

BARK Dark brown; irregularly divided into small scales.

LEAF Shorter than either white or Norway pine needles; length about 1″, ridged; sharply-pointed; two in a bundle and slightly twisted; remain on branchlets for about three years.



Two-thirds natural size

FRUIT Cones—length about 1½″; often strongly curved, brown when ripe, turning gray later, sometimes remaining on branches unopened and containing good seeds for many years; small winged triangular seeds which may be carried far in strong winds. Many trees have ripe cones when seven years old.

RANGE Found in abundance in north central and northeastern Minnesota; occurs generally in pure stands on poor sandy soil; usually first of pines to spring up and occupy land following fire; hardy and thrives on soil too poor for white or red pine.

WOOD Light, soft, not strong, close grained, clear pale brown with thick, nearly white sapwood; used for laths, box material, craft paper, firewood, and increasingly for crossties and lumber; used for windbreaks because of its hardiness; least beautiful of the native pines of Minnesota.

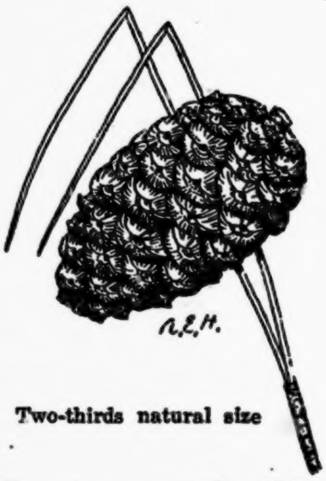
NORWAY PINE (RED PINE)

[*Pinus resinosa*]

FORM Height sometimes 100′, diameter 30 to 40″; straight trunk; branches on mature trees form an open rounded picturesque head.

BARK Becomes divided into large reddish brown plates as it matures, which gives tree its characteristic appearance and one of its common names, red pine.

LEAF Occurs in clusters of two each; dark green; 4 to 6″.



Two-thirds natural size

FRUIT A cone–length about 2″; light brown fading to gray. The thin, slightly concave cone-scales are without spines or prickles and are free from resin. Like all pines, it requires two years for cones to ripen; ripen about the middle of September but stay on branchlets until following spring or summer; seeds small, length about ⅛″, dark or mottled brown, winged and widely scattered by the wind.

RANGE Native of state; found in pure stands in many parts of northern and northeastern Minnesota; increasing in popularity for forest planting; because of its general freedom from disease and insect attack, recommended in many instances to take place of white pine. Rate of growth:–about the same as white pine; thrives on sandy loam or dry, rocky ridges.

WOOD Pale red with thin, nearly white sapwood; medium heavy, hard, coarser grained and harder than white pine; used in construction of bridges and buildings and for pilings, masts and spars; bark occasionally used for tanning leather.

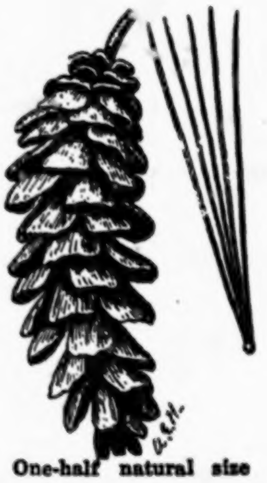
WHITE PINE

[*Pinus strobus*]

FORM Straight trunk and regular pyramidal shape with soft gray-green foliage; clear of branches for many feet, when growing in forest; branches extend horizontally in whorls in young trees, i. e., arranged in circles on stem, marking successive years of upward growth. White pine may still be found in Itasca Park 130' in height and up to 44" in diameter.

BARK Thin, smooth and greenish-gray on young trees, but thick and deeply furrowed and grayish-brown on older trees.

LEAF Length 3 to 5"; bluish-green on upper surface, and whitish beneath; occurs in bundles of five which distinguish the trees from other Minnesota pines.



One-half natural size

FRUIT Cone—length 4 to 6", cylindrical with thin and usually very gummy scales, each containing two small winged seeds. Cone matures at end of second season.

RANGE Important throughout the northern, central, and eastern parts of state; also found scattered along Mississippi River as far south as Houston County; thrives on fertile, well-drained soil.

WOOD Light, soft, not-strong, light brown in color, often tinged with red; easily worked; manufactured into lumber, shingles and laths; used for construction purposes—cabinet making, interior finish of buildings, wooden ware, and masts for vessels.

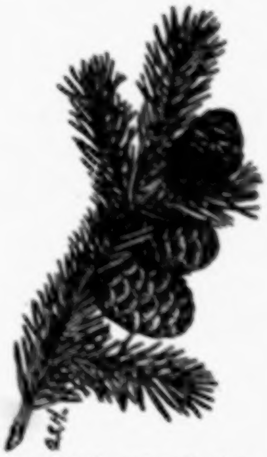
BLACK SPRUCE

[*Picea mariana*]

FORM Small tree; straight trunk and somewhat drooping branches; mature tree reaches height of 20 to 30'; however, in better soil same tree might attain height of 70 to 80'; often associated with tamarack, balsam, and white cedar. In cold swamps the growth is practically stagnant and trees 2" in diameter have been found to be 127 years old.

BARK Dark, scaly, and similar to white spruce.

LEAF Bluish-green, short, pointed, four-sided; length ⅜"; found scattered thinly over branches; shorter than those of white spruce.



One-half natural size

FRUIT Cones oval shaped; length ½ to 1⅜", young cones purple; mature cones dark brown, remain on trees indefinitely and open in the fall to liberate seeds; seeds small, dark brown and winged, mature in one season.

RANGE Northern and northeastern parts of state, extending as far south as northern Anoka County.

WOOD Yellow-white, light, soft, and medium strong; used more extensively for paper pulp than any other tree; also used extensively for Christmas trees; not recommended for ornamental planting. Spruce gum is obtained from this tree.

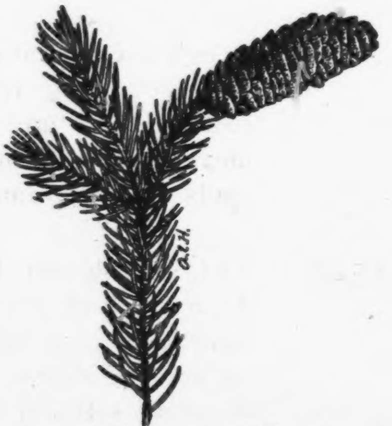
WHITE SPRUCE

[*Picea glauca*]

FORM Height attained, occasionally 100′ with a diameter of 2′; straight trunk; long, stout branches form broad conical head.

BARK Dark gray or gray-brown and scaly.

LEAF Four-sided and crowded along branchlets; length ⅓ to ¾″; pale bluish when young; dark bluish-green when mature; sharply pointed, having a slightly disagreeable odor when crushed.



One-half natural size

FRUIT Slender cone; length about 2″; cone scales round and soft at ends; thin and flexible when mature; narrow-winged seeds mature in one season; cones drop during winter after opening and shedding seeds.

RANGE Extensively found in forests of northern Minnesota, reaching outward to the St. Croix Valley; thrives on dry soils associated with pine, and on moist soils and in swamps with balsam and tamarack; also found associated with mixed hardwoods.

WOOD Light, strong, soft, straight grained yellow-white; used in the manufacture of various products, most important of which is paper. Largest trees are sawed into lumber and used for general construction—airplanes, furniture parts, canoe paddles and sounding boards for musical instruments; planted quite extensively for ornamental purposes, windbreaks, and shelter belts; ranks high as a Christmas tree.

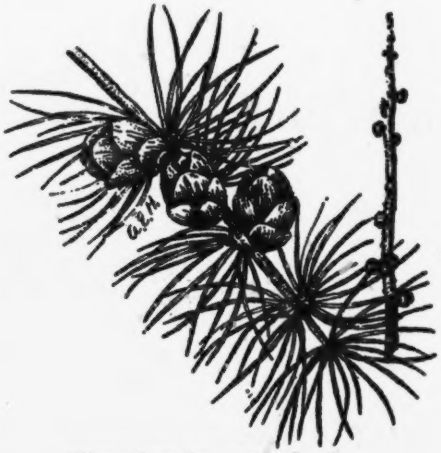
TAMARACK (LARCH)

[*Larix laricina*]

FORM Straight, upright trunk, extending to top of tree; spreading or ascending branches; height 30 to 70', diameter 14 to 24" in some instances. Large trees are rare as most old specimens were killed years ago by the larch sawfly.

BARK Rough and separates on the surface into thin, reddish-brown scales. Twigs are light brown and covered with numerous tiny spurs or short branches.

LEAF Flat, soft, slender; length about 1"; borne in clusters on spur-like branches and distributed singly on terminal shoots; bright green in spring, soft and flexible, turning dull yellow in September or October just before falling; Tamarack is the only conifer in Minnesota that sheds all its leaves each fall. When in foliage, it is very beautiful.



Three-fourths natural size

FRUIT Young cones red or greenish; mature cones light brown; width ½", length ¾"; nearly spherical; open in the fall to liberate small winged seeds. Cones often remain on trees several years.

RANGE Chiefly in swamps in northern part of state in region of coniferous forests; occasionally in drier localities where it reaches larger size; found southward scattered in cold swamps throughout the hardwood region as far south as the Twin Cities.

WOOD Light yellowish-brown, heavy, hard and very durable in contact with soil; used for posts, poles, ties, well cribbing, fuel, kraft paper, and locally for lumber.

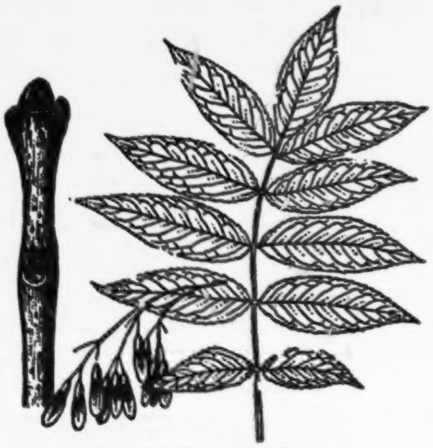
BLACK ASH

[*Fraxinus nigra*]

FORM Medium sized tree; height 35 to 75', diameter 1 to 2'.

BARK Grayish on older portions of tree, furrowed and somewhat separated into thin scales which are easily rubbed off; new growth of light green color.

LEAF Opposite on stem; compound, consisting of 7 to 11 leaflets; oblong in shape and not stalked except the terminal leaflet; terminal bud is large and pointed; leaves smooth on both surfaces.



One-fourth natural size

FRUIT Usually twisted; generally similar to that of all ashes, except that the thin wing nearly surrounds the seed part; seeds usually germinate and start growth the second year.

RANGE Fairly plentiful in state except in western half; most abundant in cold, moist locations and along low banks of streams.

WOOD Medium dark brown, sapwood of lighter color, coarse grained, heavy, somewhat soft but fairly durable in contact with soil; not as strong or valuable as green or white ash; easily separated into thin layers furnishing excellent material for baskets, hoops, etc.; also used in cabinet making and for fence posts; does not grow rapidly.

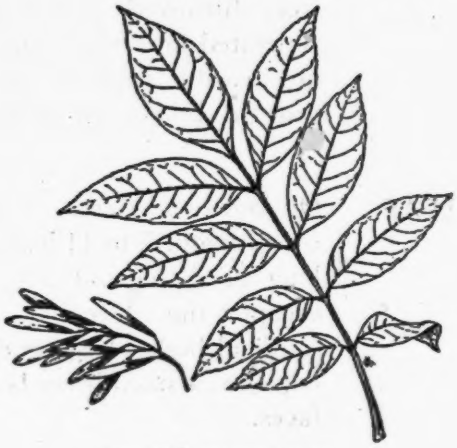
RED ASH

[*Fraxinus pennsylvanica*]

FORM Height 40 to 60'; diameter rarely exceeds 18 to 20"; stout, upright branches form compact irregularly shaped head.

BARK Trunk grayish-brown, rather prominently ridged but not quite as rough as white ash.

LEAF Length 10 to 12", compound with 7 to 9 oblong leaflets, each of which gradually narrows at apex into a long slender point, not symmetrical at base; light yellowish-green above, paler below, conspicuous middle-rib and branching veins; turns yellow or rusty brown before falling. Flowers appear late in spring as leaves begin to unfold.



One-half natural size

FRUIT Winged and in clusters; length 1 to 2¼", width ¼ to ⅓"; seed located at base of wing.

RANGE Grows mostly on low ground throughout state but is much less common than green ash.

WOOD Heavy, hard, rather strong, brittle, coarse-grained, light brown with thick lighter brown sapwood streaked with yellow; uses similar to those of the more valuable white ash.

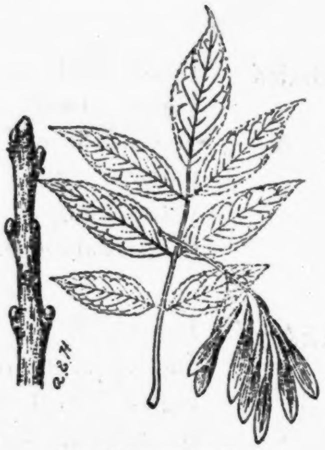
GREEN ASH

[*Fraxinus lanceolata*]

FORM Height 50′, diameter 2′ or more; slender spreading branches forming a round top.

BARK About ½″ thick; dark brown or gray, tinged with red; strongly furrowed or ridged.

LEAF Length 10 to 12″; compound, and opposite on stem; each compound leaf has from seven to nine stalked leaflets; pointed and slightly toothed on margin; differs from white ash in having leaves that are bright green or yellow-green on both sides.



One-fifth natural size

FRUIT Flat and winged; length 1 to 2¼″, width ¼ to ⅓″, with winged portion extending well down past middle or seed-bearing part; slightly notched at outer end; wing has a somewhat square appearance.

RANGE Common throughout state except in western prairie region; most abundant in valleys and along streams; best and most abundant of the ashes in Minnesota.

WOOD Heavy, hard, rather strong, brittle, coarse grained; light brown, with broad layer of lighter sapwood; commercially valuable and used for the same purposes as those of the white ash; used extensively for ornamental and farm forest plantings; fairly fast growing and will withstand severe conditions of both soil and climate; rapidly grown from seed.

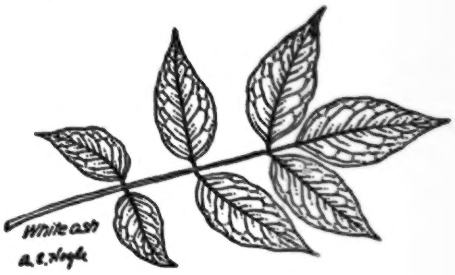
WHITE ASH

[*Fraxinus americana*]

FORM Large tree; tall and often graceful trunk; average height 50 to 90′, diameter 1 to 2′; however, in many instances larger trees are found. Stout, upright branches form a narrow crown in the forest, and with sufficient space, a round-topped or pyramidal head.

BARK Dark, and nearly smooth on young twigs and branches; greenish-brown on older trees; narrow ridges are separated with marked regularities by deep diamond-shaped fissures.

LEAF Length 8 to 10″; compound and opposite on stem, consisting of 5 to 9 (usually 8) plainly stalked, sharp pointed leaflets; dark green and smooth above, pale green or whitish beneath.



One-half natural size

FRUIT Winged; length 1 to 1¼″; resembles canoe paddle blade with seed toward handle end. Seeds mature in autumn; distributed effectively by the wind.

RANGE Found only in southeastern part of state; grows best in rich mois soil.

WOOD Light brown, close grained, heavy, tough and elastic; preferred to all native woods for making tool handles and athletic and sports equipment; also used for agricultural implements, butter tubs, furniture, interior finishes, posts, ties, fuel and for ornamental purposes. Its fairly fast growth makes it desirable for farm forest plantings.

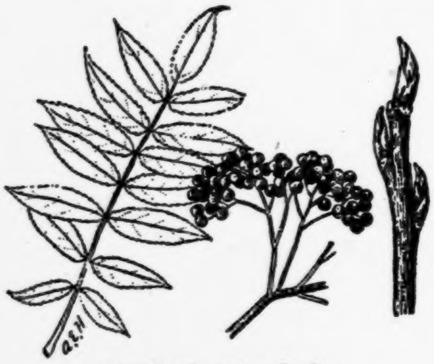
MOUNTAIN ASH

[*Sorbus americana*]

FORM Shrub or small tree; height sometimes 20 to 30', diameter 4 to 12"; spreading, slender branches form narrow round-topped head.

BARK About ⅛" thick; smooth, light gray surface, irregularly broken by small appressed plate-like scales.

LEAF Compound; length about 6 to 8", composed of 13 to 17 leaflets; each leaflet 3 to 4" long and about 1" wide at the middle; leaflets have long points with toothed edges, bright green above, turning bright yellow in fall.



One-third natural size

FRUIT Bright orange, rounded berry; diameter about ¼"; has thin layer of sour flesh; fruit gives tree ornamental appearance.

RANGE Found scattered in woods of northern Minnesota as far south as Pine and Mille Lacs Counties; best development in northeastern Minnesota; numerous along edges of swamps; does best in moist locations, thriving fairly well in drier areas and on thinner soils.

WOOD Light, soft and weak; pale brown, with light colored sapwood; slow growth gives it very close grain; has no commercial value, except for ornamental purposes and medicinal qualities of inner bark.

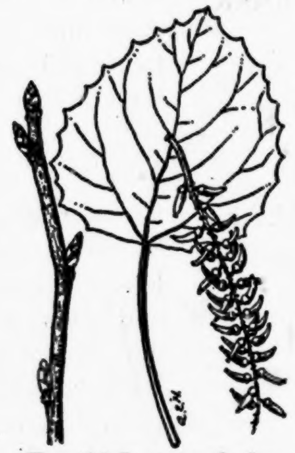
LARGE-TOOTH ASPEN (POPLAR)

[*Populus grandidentata*]

FORM Medium to large; height sometimes 60 to 80', diameter 10 to 20"; slender rather rigid branches form narrow round-topped head.

BARK Smooth, gray or yellowish-green; furrowed and dark brown at base of old trees.

LEAF Coarse-toothed; length 2 to 4"; dark green upper surface; appears one to two weeks later than that of quaking aspen, and at first is silvery white. Buds are light gray, downy, and larger than those of quaking aspen.



Two-thirds natural size

FRUIT Similar to that of popple or quaking aspen; matures in May and set free as leaves unfold; easily propagated by "cuttings."

RANGE On sandy or rich soils that are moist; common, except in southwestern and northeastern parts of Minnesota.

WOOD Light brown, weak, soft, with thin and nearly white sapwood; used in the manufacture of paper, excelsior, and wooden ware.

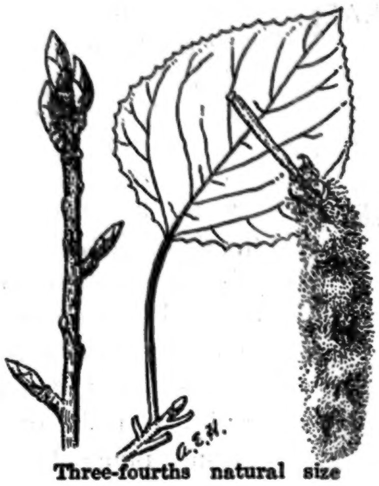
QUAKING ASPEN (POPPLE)

[*Populus tremuloides*]

FORM Small to medium size; may reach height of 65′ and diameter of 12 to 20″, but usually somewhat smaller. Young branchlets are reddish-brown and shiny, becoming gray and roughened after first year.

BARK Thin, green, white to gray-green, almost smooth with black areas around base of limbs; has bitter inner bark.

LEAF Alternate along stem; small, broadly oval, short-pointed at end and finely toothed along margin; green and shiny above, dull green below; usually ranges in size from 1 to 2″ but often 4″ or more in length as well as in width on vigorous young shoots. Leaf stalks are flattened at right angles to leaves, causing leaves to quake or tremble in a very slight breeze.



Three-fourths natural size

FRUIT Ripens in late spring (May or June) before full expansion of leaves; consists of cottony mass containing tiny round light brown seeds that usually germinate in a few hours after released from trees.

RANGE Found in all parts of Minnesota; one of first species to appear after cutting or fire; found commonly on cut-over land, grows well on sandy, gravelly soils, but thrives better on good soil.

WOOD Light brown, surrounded by heavy nearly-white sapwood; light, soft, not strong; short-lived; may be propagated by "cuttings," seeds or suckers; used extensively in manufacture of pulpwood for book, magazine paper, boards for food containers such as lard pails, butter pails, butter tubs, and cheese boxes.

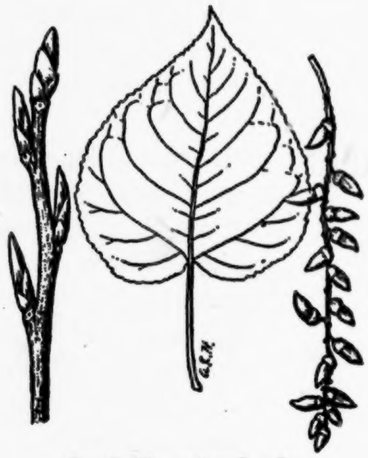
BALM OF GILEAD (BALSAM POPLAR)

[*Populus balsamifera*]

FORM May attain height of 50 to 80′ and diameter of 1½ to 3′ or more; grows upright with narrow, straight top which later becomes somewhat broad.

BARK Smooth, brown-gray color, deeply furrowed, gray-black color on old trunks.

LEAF Ovate, long pointed, edges finely-toothed, dark green and shiny above; pale and often rusty tinged beneath. Buds are large, pointed golden-yellow resembling balsam, and covered generously with varnish-like resin or pitch; gives off strong, pungent aroma.



One-half natural size

FRUIT Small, cotton-like, easily carried by wind for long distances; appears in May or June.

RANGE Found throughout northern part of state, along streams and edges of swamps or in other cool localities.

WOOD Heavy when green, light when dry; soft, not very strong, close grained, light brown, sapwood white; used for pulp, boxes, packing cases and rough lumber, rots readily in contact with ground.

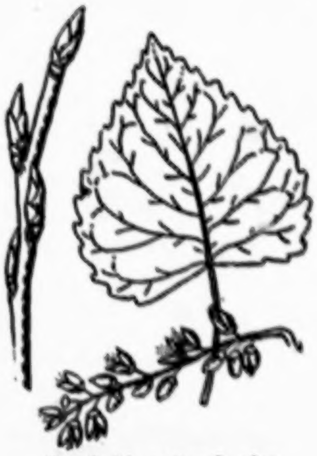
COTTONWOOD

[*Populus deltoides*]

FORM Height may reach 50 to 80′, diameter 3 to over 4′; long pyramidal or crown; grows rapidly; therefore, often planted to furnish shade quickly.

BARK Light gray on young trees and dark gray and rough on older trees.

LEAF Alternate; broadly ovate or triangular, pointed, square at base; finely toothed or wavy on edges, 3 to 5″ across each way; covered with soft white hairs on underside and flattened with slender stems from 2 to 3″ long; winter buds covered with chestnut-brown, resinous scales.



One-half natural size

FRUIT Two to four, valved, thin capsules borne on short stock in drooping "catkins"; seeds, when set free in late May or June, minute, pale, brownish-white, enclosed in cluster of white cottony hairs which carry them for long distances. There are two kinds of flowers borne separately on different trees; female trees throw cotton.

RANGE Throughout Minnesota, often forming extensive groves; will grow on dry locations but makes most rapid progress on moist sites.

WOOD Soft, light-weight; warps easily when drying and rots readily; used for boxes, fencing, fuel, rough lumber for inside use, making high-grade magazine paper for printing half-tone illustrations; grown extensively for windbreaks owing to rapid growth and adaptability to soil; usually propagated by "cuttings" or seedlings; found along water courses.

BASSWOOD (LINDEN)

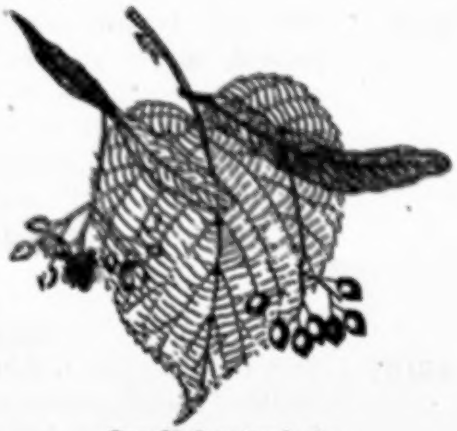
[*Tilia americana*]

FORM Height 60 to 80 ', diameter 1 to 3'; trunk often continues straight into top of dense rounded crown.

BARK Light brown with shallow, vertical ridges.

LEAF Length 3 to 6", width about 3 to 6", heart-shaped, thin, saw-toothed, sharp-pointed at tip; at maturity thick, shiny, green above, paler underneath.

FRUIT Rounded, nut-like; 1 to 2 seeds; nut ¼ to ⅓" in diameter, covered with short, thick, brownish wool, attached in clusters to a leafy bract which later acts as a wing to carry seeds away on wind; fruit often hangs on tree long into winter. Flowers are fragrant, and from them choice-grade honey is made by bees.



One-third natural size

RANGE Common throughout state except in extreme northeastern part grows chiefly on rich, alluvial soil.

WOOD Light, soft, tough, not durable, light-brown with scarcely distinguishable sapwood; used in manufacture of paper pulp, wooden ware, furniture, trunks, excelsior, crating, drawing boards, kegs, barrel heads, inner soles for shoes, and lumber; inner bark used for mat fibre, cordage, etc. Basswood trees are recommended for ornamental plantings.

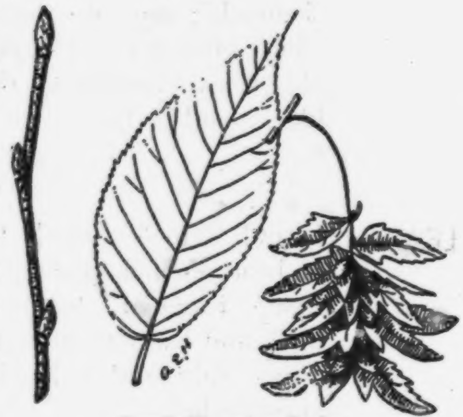
BLUEBEECH (HORNBEAM)

[*Carpinus caroliniana*]

FORM Small, slow-growing, bushy tree with spreading top of slender, crooked or drooping branches; height rarely 40'. It is also known as Ironwood Hornbeam, and Water Beech.

BARK Light gray-brown, smooth, sometimes marked with broad, dark-brown horizontal bands; fluted on trunk with irregular ridges extending up and down.

LEAF Alternate; oval, long-pointed double-toothed along margin; length 2 to 3"; veins prominent similar to those of the Hop Hornbeam, pale bronze-green when young; at maturity, thin and firm, and pale, dull-green above, light yellow-green below.



One-half natural size

FRUIT Clusters with leaf-like bracts, each with nutlet about ⅛" long attached to outside; leaf-like bract may act as wing in aiding seed distribution by wind; blossoms in April and May; fruit ripens in August.

RANGE In moist woods, especially along streams, common throughout southern half of state extending north into Itasca Park and White Earth Indian Reservation.

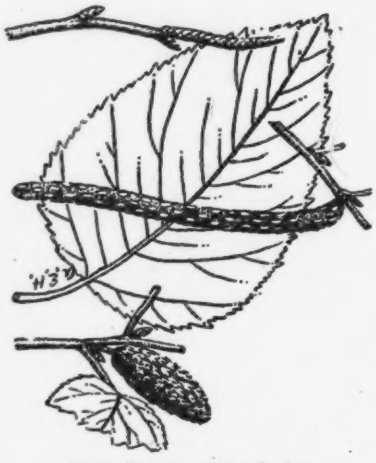
WOOD Tough, close-grained, heavy, hard and strong; light brown, with thick white sapwood; used for levers, tool handles, wooden cogs, mallets, wedges and fuel.

PAPER BIRCH (Canoe Birch—White Birch)

[*Betula papyrifera*]

FORM Height 65 to 70′, diameter 14 to 20″; twigs dull orange or red during first winter, later become brown.

BARK Thin, papery; becomes pure white with age, marked by many pores or "lenticels"; separates into thin sheets which often roll up; bark thickens on old trees, becoming dark (nearly black) and scaly.



Two-thirds natural size

LEAF Length 2 to 3″, width 1 to 2″; oval or heart-shaped, pointed, rounded at base, irregular toothed; becomes thick and leathery in texture; dull on upper side and yellowish-green on lower side.

FRUIT Resembles cone, containing many tiny seeds; length about $\frac{1}{16}$″; ripens in August and September; readily propagated by seeds which may even be scattered on the snow.

RANGE Generally abundant throughout state, except southwestward.

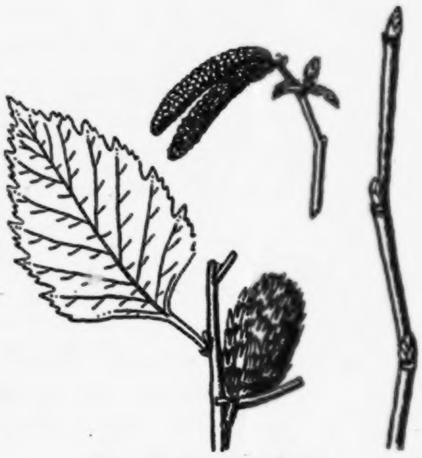
WOOD Hard, strong, tough, light in weight, brown tinged with red, nearly white sapwood; used for spools, shoepegs and lasts, toothpicks, toys, snowshoe frames, handles, paper pulp, flooring, firewood, and interior finish; bark also extensively used by northern Indians for canoes and wigwams, and for making baskets, cups, bags, and other useful utensils.

RIVER BIRCH (RED BIRCH)

[*Betula nigra*]

FORM Normally large; height 80 to 90', almost as large as yellow birch; however, in Minnesota it is of medium size, often forming extensive thickets.

BARK Dark brown at base of old trunks, deeply furrowed; higher up on main stem and on larger branches, becomes lustrous reddish-brown; peels more or less freely; twigs, reddish color.



Two-thirds natural size

LEAF Alternate; length 2 to 3"; more or less triangular with double toothed edges; upper surface dark green, and lower surface pale yellow-green.

FRUIT Cone shaped catkin; length about 1"; densely crowded with little winged nutlets; blossoms in April and May; ripens in late spring or early summer.

RANGE Grows along rich bottom lands of streams and rivers in southeastern corner of state, especially in Mississippi and Root River Valleys; common along Mississippi River as far as Wabasha County; also reported near Mankato.

WOOD Light brown, close-grained, hard and strong; used in manufacture of furniture; however, since this tree is scattered in its distribution and mostly confined to banks of streams, it does not figure largely in commercial lumbering, but is used to a great extent for fuel.

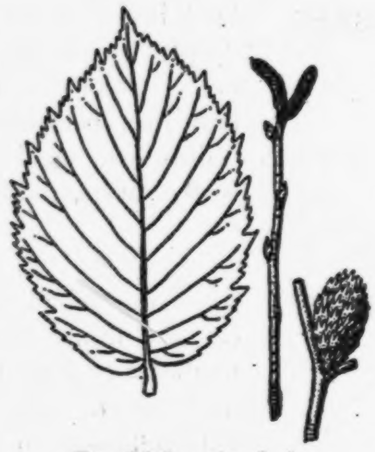
YELLOW BIRCH

[*Betula lutea*]

FORM Large; height occasionally 85', diameter 2 to 3'; however, it may have a short or crooked trunk.

BARK Yellow-gray or straw color; peeling freely into thin papery layers which produce a ragged appearance on the main stem and lower branches; twigs light brown, lustrous, and slightly aromatic with oil of wintergreen.

LEAF Alternate; oval to oblong, deeply and finely toothed; length 3 to 5"; dull dark green on upper surface and paler beneath; much larger than paper birch.



Two-thirds natural size

FRUIT Cone; length about 1", contains chestnut-brown winged seeds when ripe.

RANGE Common in the northern half of state on better soils where cool, moist conditions prevail.

WOOD Heavy, strong, hard, close-grained, light brown; takes good polish; used for flooring, interior finish, veneers, wooden ware, furniture, and small wooden novelties; excellent for fire wood. Oil of wintergreen may be obtained from bark.

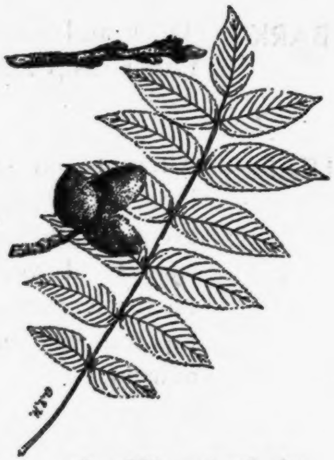
BUTTERNUT (WHITE WALNUT)

[*Juglans cinerea*]

FORM Smaller than black walnut, though often reaches height of 80′ and diameter of 3′; trunk usually forked or crooked; top develops into open, broad crown; may be distinguished from black walnut by velvet collars just above scars left by last year's leaves.

BARK Divided into ridges, light gray on branches and trunks of small trees; becomes darker on large trees.

LEAF Length 15 to 30″, each with 11 to 17 sharply pointed, alternate, oblong, finely-toothed leaflets each 2 to 3″ long, yellowish-green above and hairy underneath.



One-fifth natural size

FRUIT Light brown nut enclosed in oblong, somewhat pointed, sticky, yellowish-green husk about 2″ long; husk covered with short, rusty, clammy, sticky hairs. Nut has rough, grooved shell and oily edible kernel.

RANGE Found naturally in same range as black walnut (southern Minnesota) but ranges farther northward in state; grows as far north as Mille Lacs County. Within its range, this tree should be planted in greater numbers on land not needed for agriculture.

WOOD Light, soft, not strong; coarse grained, light brown; takes good polish; used for furniture and interior finish for houses. A yellow dye can be made from husks of the nuts and from the inner bark.

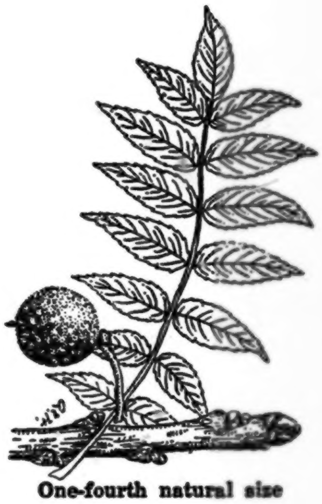
BLACK WALNUT

[*Juglans nigra*]

FORM Handsome forest tree when growing singly in forest; height often 100′, diameter 3 to 5′; straight and clear of branches for half its height; when grown in the open, stem short, crown broad and spreading.

BARK Thick and very dark brown; divided by rather deep fissures into round ridges.

LEAF Alternate on stem; compound, 1 to 2′ long, consisting of 7 to 11 pairs of yellow-green leaflets, each sharply pointed; smooth above, pale and hairy underneath; leaflets about 3″ long, extremely tapered at ends and toothed along margin.



One-fourth natural size

FRUIT A large, round nut borne singly or in pairs and enclosed in solid green husk, which is not sticky and does not spread open even after nut is ripe. The nut is black with very hard, thick, finely-ridged shell, enclosing a rich, oily kernel which is edible and highly nutritious; matures in fall.

RANGE Grows on rich bottom lands and moist, fertile, hillsides in southern part of state; is easily propagated from nuts and grows rapidly in good soil.

WOOD Rich chocolate-brown heartwood is of superior quality and value; heavy, hard, strong, and comparatively free from warping and checking, takes a high polish and is very durable; highly prized for a great variety of uses such as furniture, gun-stocks, and airplane propellers; finest veneers are made from burls and roots; small trees consist mostly of sapwood, which is light-colored and not durable.

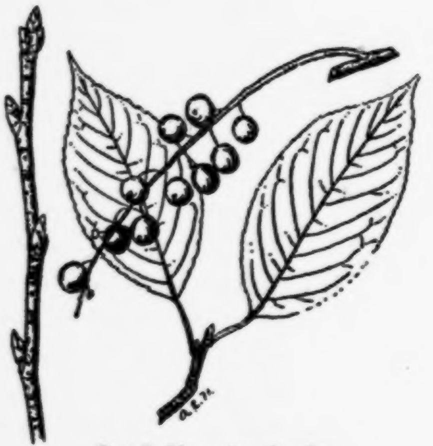
BLACK CHERRY

[*Prunus serotina*]

FORM Largest of cherry trees; height 30 to 70′, diameter 8″ to 2′; long clear trunk with little tapering when grown in forest; when grown in open, tree has short trunk with many branches and irregular spreading crown.

BARK On young trunk smooth and bright, reddish-brown, marked by conspicuous narrow, white horizontal lines; has bitter almond taste; on older trunks, thin, dark brown, rough and broken into thick irregular plates.

LEAF Alternate; simple, oval, thick, shiny above, paler below; edges broken by many fine incurved teeth.



One-half natural size

FRUIT Borne in long, hanging clusters resembling choke cherries; dull purplish-black about the size of a pea; is edible but somewhat astringent; ripens in late summer; has some medicinal value.

RANGE Fairly common in Minnesota hardwood region; grows to commercial size only in southeastern part of state.

WOOD Reddish-brown with yellowish sapwood, medium-heavy, strong, fine-grained; does not warp or split in seasoning; has exceptional lustre and color; used for furniture, interior furnishing, tools, and implement handles; next to black walnut, black cherry has highest value of any hardwood in Minnesota.

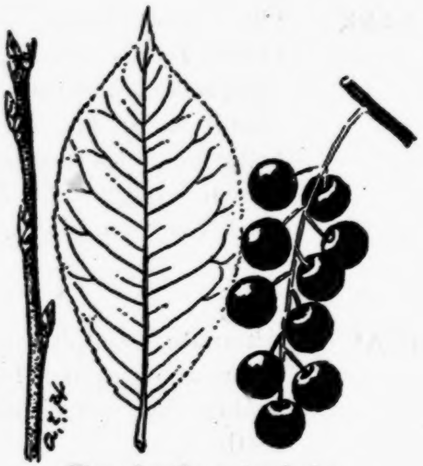
CHOKE CHERRY

[*Prunus virginiana*]

FORM A shrub or small tree; height usually not over 20 to 25′, diameter 4 to 8″; straight trunk, small, erect or horizontal branches.

BARK Thin, grayish-brown; becomes roughened with age; inner bark has bitter cherry flavor and aroma.

LEAF Alternate on twig; broadly oval, abruptly and sharply pointed, fine-toothed, bright green above, paler underneath; length 2 to 4″, width 1 to 2″. Flowers appear in dense clusters; length 3 to 6″; petals round and white; flower buds open in May or June.



Three-fourths natural size

FRUIT Reddish, turning nearly black when fully ripe; skin of fruit thick; flesh thin and dark, very astringent to the taste.

RANGE Common throughout state along streams, open woods, cut-over and brush areas.

WOOD Heavy, hard, not very strong; of no commercial value in Minnesota; popular tree for birds; used extensively for ornamental planting.

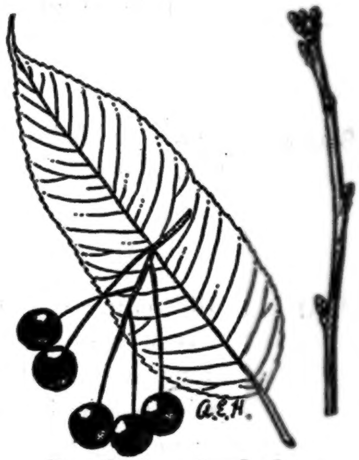
PIN CHERRY (WILD RED CHERRY)

[*Prunus pennsylvanica*]

FORM Shrub or medium-sized tree.

BARK Reddish-brown, breaking into papery layers; marked by irregular, horizontal bands of orange color lenticels.

LEAF Length 3 to 4"; width about 1'; oblong; pointed; finely incurved teeth along edge shiny green when fully grown.



Two-thirds natural size

FRUIT Diameter about ¼"; thick, light red skin; thin sour flesh surrounding oblong stone; flesh used in homes for making jellies; fruit borne on long-stocked clusters; ripens in middle or late summer. White flowers borne in clusters, usually appear in early May when leaves are about half grown.

RANGE Common in woods throughout state except in southwestern portion; often abundant in cut-over lands, old fields, and along roadsides.

WOOD Medium light, medium soft, brownish with yellowish sapwood has no special commercial value; tree is hardy; furnishes home and feeding ground for our more useful song birds and is especially suited for home beautification.

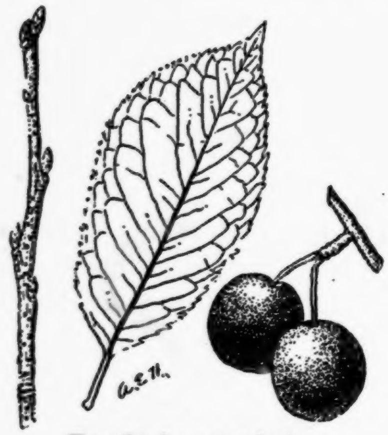
WILD PLUM

[*Prunus americana*]

FORM Shrub or small tree; height usually 15 to 25′; maximum diameter 10″; trunk usually short and thorny and divides a short distance from the ground.

BARK Thin, reddish-brown, broken into thin plates.

LEAF Alternate; somewhat oval, long and narrow-pointed, doubly toothed along edge; dark green above, paler below; length 2 to 5 ″, width about 2″. Beautiful, white or pink, fragrant flowers appear in April or May usually before the leaves.



Two-thirds natural size

FRUIT ¾″ in diameter; outer skin orange-red when ripe, with yellowish sweet flesh; flesh clings to seed; fruit ripens in late summer. Fruit is prized highly for jellies and preserves.

RANGE Found generally scattered over the state in thickets, particularly along banks of streams; grows best on rich soil or in moist locations, however, will grow elsewhere. Its hardiness also fits it for rather severe locations.

WOOD Strong, hard, close-grained; dark brown with light-colored sapwood, tree has no special commercial value other than for ornamental purposes and fruit.

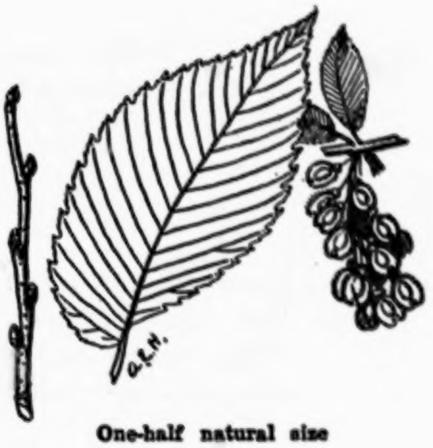
AMERICAN ELM

[*Ulmus americana*]

FORM Large tree; height 80 to 90′; diameter 2 to 4′; wide spreading branches with more or less drooping branchlets.

BARK Dark green; divided into irregular, flat-topped, thick ridges; generally firm, although on older trees it tends to come off in flakes.

LEAF Alternate; length 4 to 6″; rather thick, somewhat one-sided; doubly toothed on margin, generally rough above, smooth below; veins very pronounced and run in parallel lines from midrib to edge of leaf.



One-half natural size

FRUIT Winged, light green, oval, and wafer-like in appearance; seed portion in center surrounded entirely by wings; outer end of each wing deeply notched; seeds hang in clusters; ripen in spring; widely scattered by wind.

RANGE Fairly common throughout state; more abundant on rich bottom lands in southern half of Minnesota.

WOOD Light brown, heavy, hard, strong, tough, and difficult to split; used for wheel hubs, saddle trees, boats and ships, furniture, barrel staves and hoops, and veneer for baskets and crates; very hardy and fairly rapid in growth; especially desirable for prairie planting. Gracefulness and suitability make it desirable as an ornamental and shade tree.

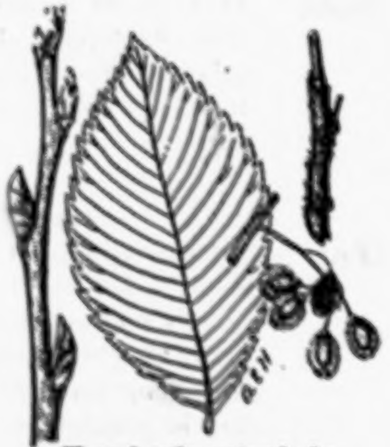
ROCK ELM

[*Ulmus racemosa*]

FORM Height 80 to 100', diameter 2 to 4'; straight trunk; somewhat conical head with long graceful branches.

BARK About 1" thick, ash-gray; divided by deep fissures into broad, flat ridges.

LEAF Resemble those of the American Elm, but are more regular in shape, smaller, smoother on both sides, and more leathery.



Three-fourths natural size

FRUIT Length ½", ovate, wafer-like; contains one seed; slightly notched at outer end; ripens in early summer.

RANGE Commonly found on bottom lands in eastern and south central parts of state, especially in Minnesota River Valley and countinues as far northward as Clearwater County.

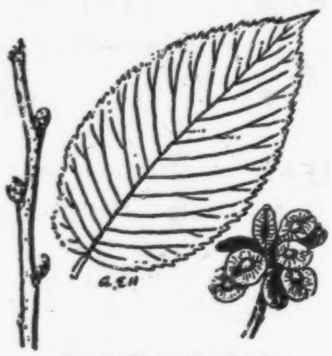
WOOD Most valuable of elms; close grained, compact and strong; light reddish-brown with thick, light colored sapwood; used for agricultural implements, sills, ties, bicycle rims, wheel chairs, hockey sticks and furniture.

SLIPPERY ELM

[*Ulmus fulva*]

FORM Large tree; height 40 to 65', diameter 16 to 24"; main branches frequently extend at right angles to trunk from broad, open, flat-topped head.

BARK Frequently 1" thick; dark greenish-brown; broken by shallow fissures, into flat ridges. New twigs scurfy; winter buds covered by brown, silky hairs.



One-half natural size

LEAF Alternate on stem; 4 to 6" in length; ovate, sharp-pointed, base not symmetrical, double toothed on edges; thick, dark green and rough on both sides; turns to yellowish color before falling.

FRUIT Seed surrounded by thin, broad, greenish wing; diameter about ½"; ripens when leaves are about half grown.

RANGE Frequently found throughout southern half of state, especially in the Big Woods; less common northward.

WOOD Dark brown with light colored sapwood; close grained, tough, strong, heavy, hard, moderately durable; used for fence posts, ties, agricultural implements, ribs for small boats and other purposes; inner bark of trunk and branches used to some extent for medicinal purposes; fairly fast growing, hardy tree.

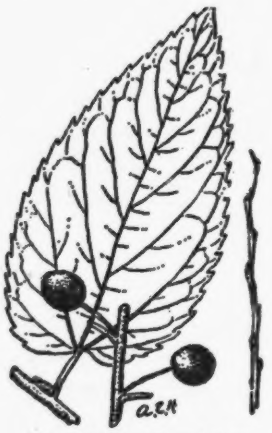
HACKBERRY

[*Celtis occidentalis*]

FORM Height 40 to 75′, diameter 10″ to 3′; limbs often crooked and angular; tree-head made up of slender pendant branches or short, bristly, stubby twigs when growing in forest; in the open, crown is generally symmetrical.

BARK Grayish-brown, much roughened with prominent, short, corky ridges.

LEAF Alternate on twig; length 2 to 4″; ovate and sharply toothed toward end of leaf; oblique at base; prominent veins; hairy on upper side.



One-half natural size

FRUIT Berry like drupe, ¼ to ⅓″ in diameter; thin, purplish skin; sweet yellowish flesh; sometimes called sugar berry; ripens in September; frequently hangs on tree most of winter.

RANGE Found sparingly in southern part of state, and western part northward through the Red River Valley; most abundant on rich alluvial soil, but will grow on various types of soil from the poorest to the richest; never found in pure forest stands.

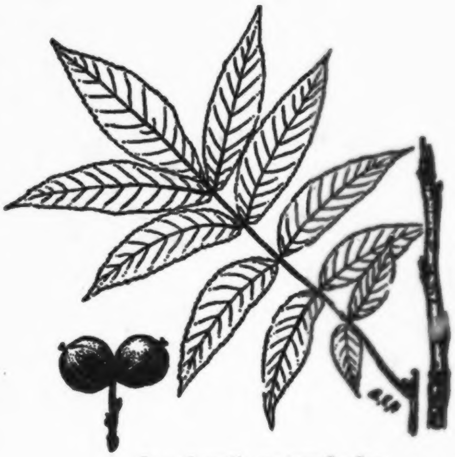
WOOD Heavy, rather soft, weak, and coarse grained; fairly durable in contact with soil; light yellow or greenish-brown with narrow white sapwood; used in manufacture of cheap furniture, fuel, and only occasionally for lumber. It is a good shade tree and is often used in ornamental planting in southern Minnesota.

BITTERNUT (SWAMP) HICKORY

[*Carya cordiformis*]

FORM Tall and slender with straight, green trunk, broadly pyramidal crown; height 40 to 75', diameter 10 to 25".

BARK Granite-gray, faintly tinged with yellow; broken into thin, plate-like scales; not as rough as most hickories; bark does not strip off as that of shagbark hickory. Winter buds are compressed, scurfy, bright yellow, ½" or more in length and are often without scales.



One-fourth natural size

LEAF Alternate; compound; length 6 to 10"; composed of 5 to 9 leaflets, with each leaflet relatively much smaller and more slender than that of other hickories.

FRUIT Nut usually thin shelled, smooth, brittle; length about 1" with thin husk which usually splits only partly down side. Nut is broader than long; kernel is very bitter.

RANGE In rich, moist woods, common southward and extending through the Big Woods north to Mille Lacs and infrequently to the upper Mississippi and the tributaries of the St. Louis River .

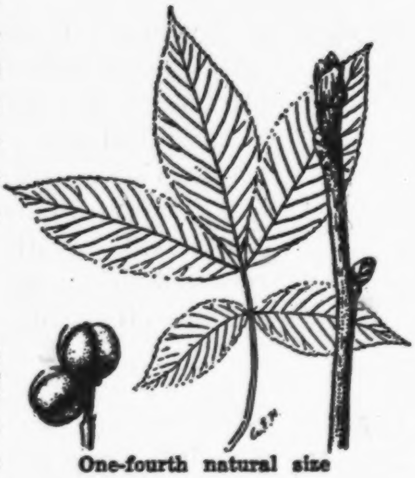
WOOD Hard, strong, heavy, and reddish-brown, used for hoops, fuel and farm implements. Considered somewhat inferior to the other hickories.

SHAGBARK HICKORY

[*Carya ovata*]

FORM A large tree; height 60 to 100′, diameter 1 to 2′.

BARK Rougher than that of other hickories; shaggy, light grey, and separates into thick, vertical strips which are only slightly attached to tree. Terminal winter buds are egg-shaped; outer bud scales have narrow tips that drop off early in spring.



One-fourth natural size

LEAF Alternate on stem; compound; length 8 to 15″ and composed of five, rarely seven, ovate leaflets; twigs are smooth or clothed with short hairs.

FRUIT A nut borne singly or in pairs, globular in shape, enclosed in husk which is thick and deeply grooved at seams and splits entirely into four parts. Nuts compressed or flattened and light-colored; known as "shagbarks" of commerce. Shell is thin and kernel sweet.

RANGE Confined entirely to southeastern corner of state, extending northward into Wabasha County; thrives on rich, damp soil and is found along streams and on most hillsides; only a small amount of hickory found in state.

WOOD Heavy, hard, tough and very strong; used largely in manufacture of agricultural implements, tool handles, and spokes for automobiles and wagons; makes very good fuel and is best of all woods for smoking meats.

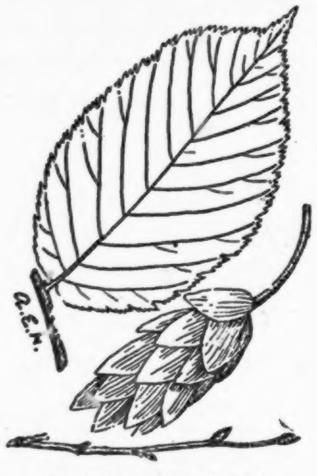
IRONWOOD (HOP HORNBEAM)

[*Ostrya virginiana*]

FORM Height 20 to 40′, diameter 5 to 12″; top generally rounded; foliage resembling that of birch; branches long and slender, drooping at ends. The tree receives its common names from the quality of its wood and hop-like fruit.

BARK About ¼″ thick; light grey-brown; finally divided into thin scales which are easily rubbed off.

LEAF Alternate; generally oblong with narrow tips, sharply toothed along margin—sometimes doubly toothed—length 2 to 4″; dark, dull, yellow-green above and light yellow-green below. It resembles somewhat the leaves of the elm.



One-half natural size

FRUIT In clusters resembling that of common hop vine; each sack contains one flattened, ribbed, hard nutlet about ⅓″ long and ⅛″ wide; blossoms in April and May; fruit ripens in July and August.

RANGE Found mostly in rich, not too dry, soil throughout state, except in northern Roseau and Lake of the Woods County in vicinity of Lake of the Woods; seldom found close to shores of Lake Superior.

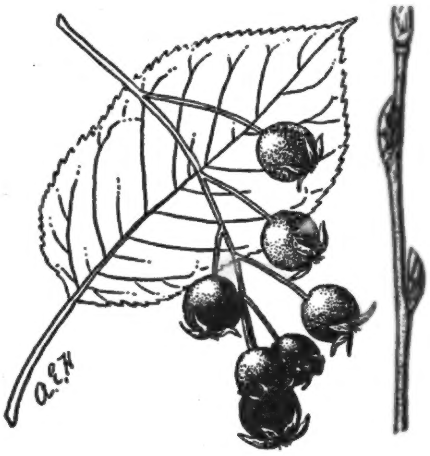
WOOD Very strong, hard, heavy, durable, light brown, with thick, pale sapwood; used for fence posts, handles of tools, mallets and other small articles, and fuel.

JUNE BERRY OR SERVICE BERRY

[*Amelanchier canadensis*]

FORM A small tree; height seldom over 20′, diameter 4 to 8″; rather narrow rounded top.

BARK Thin, usually grey, smooth on branches and upper part of stem, breaking into shallow fissures on short trunk.



Two-thirds natural size

LEAF Alternate; slender-stocked, ovate, rounded, fine-toothed; length 2 to 4″; purplish-brown until nearly mature; light green covered with scattered, silky hairs when mature. White flowers appear in erect or drooping clusters in April or May before or with leaves.

FRUIT Sweet, edible, round, dark purple when ripe; diameter ⅓ to ½″; ripens in July or August. Birds and people are very fond of this fruit.

RANGE Common throughout state, but best development is along banks of streams, shores of lakes, or open upland woods.

WOOD Heavy, hard, strong, close-grained, dark brown; has no commercial importance; desirable as ornamental tree and habitat for birds.

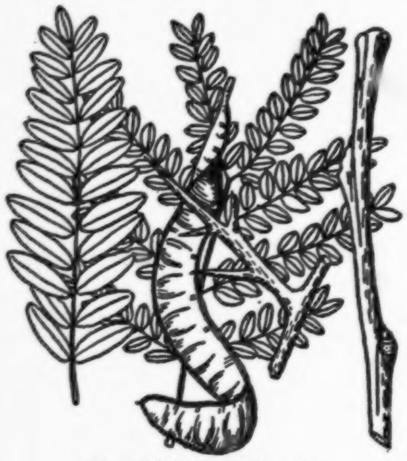
HONEY LOCUST

[*Gleditsia triacanthos*]

FORM Medium sized tree; height 30 to 50′—taller under very favorable conditions—may reach diameter of 16″; slender, spreading, somewhat pendulous branches form broad, open, rather flat top head.

BARK Dark grey or brown on old trees; divided into thin, tight scales; strong, brown, straight, sharp, shiny thorns appear on one-year-old wood and remain for many years.

LEAF Compound or feather-like with 18 to 28 leaflets or twice-pinnate consisting of 4 to 7 pairs of pinnate or secondary leaflets each 6 to 8″ in length.



One-third natural size

FRUIT A pod; length 10 to 18″, width ¾ to 1½″; flat, dark brown or black when ripe, containing seeds and yellow-whitish pulp; pod often becomes twisted as seeds ripen; seeds are hard and each is separated from the others by the pulp. Pods are eaten by many animals.

RANGE Occurs in scattered stands or as individual trees, especially in southern Minnesota in counties along the Root River Valley and Mississippi bottom lands; found in forest, but is more common in waste places beside roads and fields.

WOOD Reddish-brown, coarse-grained, hard, strong, not durable in contact with ground; however it is used for fence posts, cross ties, hubs for wheels, and fuel; has been planted to some extent for windbreaks and hedges in southern Minnesota; not a hardy tree; sprouts readily from the root.

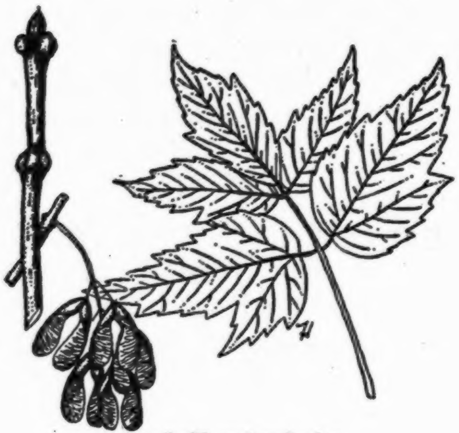
BOX ELDER

[*Acer Negundo*]

FORM Height 30 to 60′ on favorable soils, diameter may reach 18″; rather bushy on unfavorable soils; limbs and branches fragile; tree somewhat subject to fungus disease and attack by insects.

BARK Smooth and green on young branches; thin grayish to light brown and deeply divided on old trees.

LEAF Length 5 to 8″; compound, usually with three leaflets (rarely 5 to 7) which are opposite on stem, smooth, lustrous green; length of leaflets 2 to 4″, width 1 to 2″.



One-half natural size

FRUIT Cluster, winged and similar to that of sugar maple, but smaller; ripens in late summer or early fall; often stays on trees all winter.

RANGE Common throughout the state; less abundant in northeastern part; grows naturally along streams and in cool ravines; a fairly rapid-growing tree, prolific in reproduction; however, many young trees are destroyed by grazing and cultivation; hardy tree for severe locations.

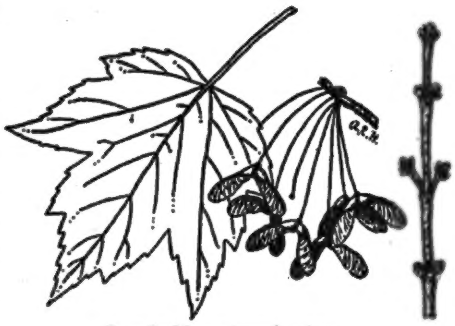
WOOD Creamy white, soft, light and close-grained; decays rapidly in contact with heat and moisture; used occasionally for fuel; has no general commercial value.

RED MAPLE

[*Acer rubrum*]

FORM Medium sized shade tree; height 40 to 65′, diameter 10″ to 2′.

BARK Smooth, light grey on young stems, dark grey and rough on old limbs and trunk; old bark divided by shallow, flaky ridges at surface, making tree look shaggy.



One-half natural size

LEAF Opposite on stem; length 2 to 5″; has 3 to 5 pointed saw-toothed lobes separated by sharp angular openings; upper surface when mature, light green; lower surface whitish and partly covered with pale down; first of maple to turn in color in fall to brilliant shades of red, orange, and yellow. Winter buds are small, red, and somewhat rounded.

FRUIT Consists of pairs of winged seeds ½ to 1″ in length on long, drooping stems; red, reddish-brown, or yellow; ripens in late spring or early summer.

RANGE Distributed throughout eastern half of state as far south as Houston County and west to a line running south from Mahnomen to Redwood Falls.

WOOD (Soft maple) Heavy, close-grained, rather weak, light-brown; used in the manufacture of cheap furniture, woodenware, and fuel; wood has little commercial value; the bark is sometimes used in dyeing. Shape and beautiful foliage colors make this an important ornamental tree.

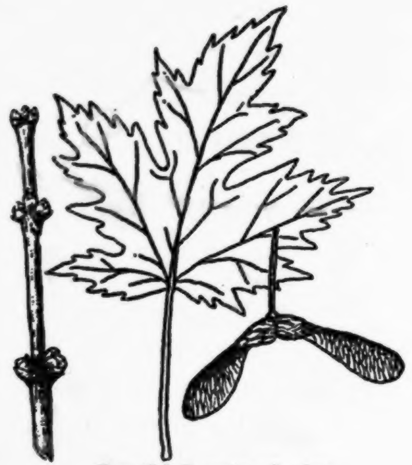
SOFT MAPLE

[*Acer saccharinum*]

FORM Height 100′ or more, diameter 3′ or more; trunk usually short, divided into a number of long ascending limbs which are again divided and their small branches droop, but turn upward at tips.

BARK On young branches smooth and varies in color from reddish to a yellowish-grey; on old branches dark grey and broken into long flakes or scales.

LEAF Opposite on stem; 3 to 5 lobes ending in long points with toothed edges and separated by deep, angular openings; pale green on upper surface and silvery underneath; buds rounded and red or reddish-brown.



One-third natural size

FRUIT A pair of winged seeds, wings 1 to 2″ long on slender, flexible, thread-like stems about an inch in length.

RANGE Common in southern Minnesota; scattered northward to the upper Mississippi, Vermillion Lake, etc.

WOOD Light-brown, strong, fairly hard, even texture, rather brittle, easily worked; decays readily when exposed to weather or soil; occasionally used for flooring, furniture, and fuel; often mixed with red maple for commercial purposes; extensively planted as shade and ornamental tree.

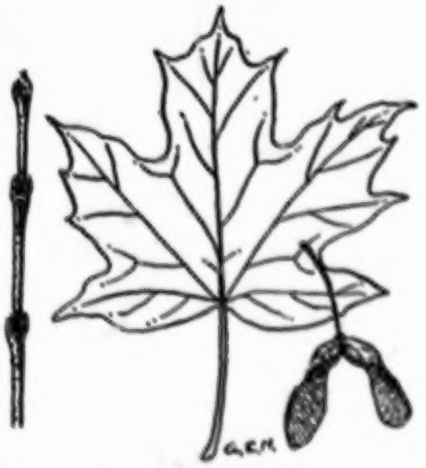
SUGAR MAPLE

[*Acer saccharum*]

FORM Height 80′ or more, diameter about 2′; symmetrical; heavy crown affords dense shade.

BARK On young trees light grey to brown and somewhat smooth; on older trees grey to almost black with irregular plates or scales. Twigs are smooth and reddish-brown with sharp-pointed winter buds.

LEAF Width 3 to 5″, opposite on stem; 3 to 5 pointed, smooth-edged lobes; division between lobes rounded; dark green on upper surface, lighter green below; in autumn turns to brilliant shades of dark red, scarlet, orange, or yellow.



One-third natural size

FRUIT Consists of two slightly connected divergent wings, each containing one seed; length about 1″; easily carried by the wind.

RANGE Grows in cool, rich locations in eastern half of state.

WOOD Light brown, hard, heavy, strong, close-grained; known commercially as hard or rock maple; used in the manufacture of flooring, furniture, shoe lasts and numerous small articles, maple syrup, maple sugar, and fuel; important for ornamental plantings.

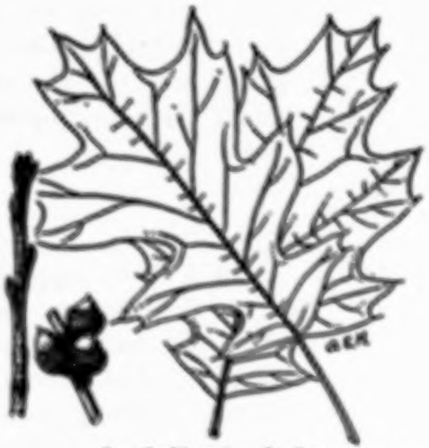
BLACK OAK

[*Quercus velutina*]

FORM Height 35 to 75', diameter 9 to 30"; clear trunk for 20' or more on large trees; crown wide and irregular shaped.

BARK On young trees, smooth and dark brown; thick and black on older trees, with deep furrowed and rough broken ridges; inner bark bright yellow and bitter owing to tannic acid.

LEAF Alternate; length 5 to 10", width 3 to 8"; lobed half way to midrib with triangular, bristle-pointed lobes from 5 to 7"; crimson in spring, silvery when half-grown, brown in autumn; when mature, thick dark green and shiny on upper surface, and pale on lower; covered more or less with down; conspicuous rusty brown hairs in forks of veins.



One-half natural size

FRUIT Light brown nut matures the second season; length ½ to 1"; shape somewhat round; one-half to three-fourths of nut enclosed in thin, dark-brown, scaly cup; kernel yellow and extremely bitter.

RANGE Found almost wholly in southeastern Minnesota on dry ridges.

WOOD Hard, heavy, strong, coarse-grained, not tough, checks easily; bright reddish-brown with thin outer edge of paler sapwood; principally used for fuel; tannin and yellow dye made from bark.

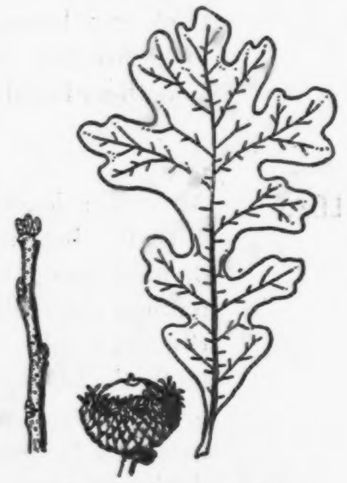
BURR OAK

[*Quercus macrocarpa*]

FORM Height 80′ or more under favorable conditions, diameter 3 to 4′ or more; under unfavorable conditions not over 15′ in height with gnarled branches covered with corky tissues; in dense forests trunk straight with short branches; however, tree usually has broad top of heavy spreading branches and relatively short body; takes its name from fringe around cup of acorn.

BARK Thick, deeply furrowed on surface into irregular plate-like broken scales often slightly tinged with red.

LEAF Length 6 to 12″, width 3 to 6″; crowded at ends of twigs; resembles common white oak; each species has pair of deep indentations near base and wavy notches on broad middle and upper portions.



One-half natural size

FRUIT Acorn set deeply or almost enclosed in fringed, burr-like cup ovoid in shape. The diameter may reach 1″ or more; however, it varies widely in respect to size and degree to which the nut is enclosed in the mossy fringed cup. Seed is bitter.

RANGE One of the commonest trees in Minnesota, extending far out on the prairies in western part of state; usually grows singly in open stands and in fields; requires moist, well-drained soil; easily propagated, but grows slowly.

WOOD Heavy, hard, strong, tough, durable; rich brown; uses similar to those of white oak.

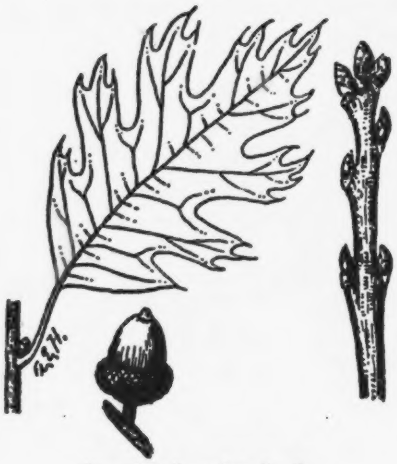
RED OAK

[*Quercus borealis*]

FORM Height 55 to 80′; diameter ranges from 2 to 3′; tall and straight with clear trunk and narrow crown.

BARK On young stems smooth, dark grey to dark brown; on older trees; thick and brown, broken by shallow fissures into regular, flat smooth-surfaced, vertical plates.

LEAF Alternate; length 5 to 9″, width 4 to 6″, broader toward the tip; divided into 7 to 9 lobes each extending one-half way to the midrib; each lobe somewhat coarsely toothed, bristle-tipped, firm; dull green above, paler below, often turning a brilliant red in fall. Buds thick and pointed at top.



One-third natural size

FRUIT Large, bitter acorn, maturing the second year; length ¾ to nearly 2″; blunt-topped, flat at base, with base enclosed in a very shallow, dark-brown cup.

RANGE Grows throughout Minnesota, but is most common and of best quality in rich soil of southern, central, and southeastern Minnesota.

WOOD Light, reddish brown; hard, strong and coarse; used for construction and finish of houses, cheap furniture, and fuel; grows more rapidly than most oaks; therefore, production is widely encouraged in southern portions of state for both timber and shade.

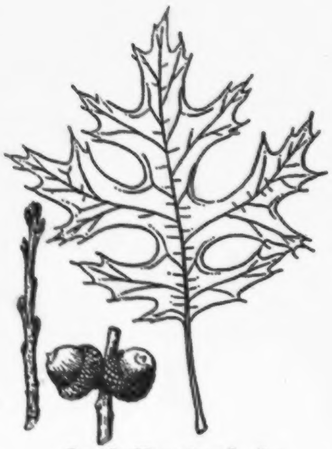
SCARLET OAK (JACK OAK)

[*Quercus coccinea*]

FORM Height 40 to 65'; diameter 2 to 3', occasionally larger; trunk tapers rapidly; branches droop at ends forming a narrow, open crown.

BARK Rather smooth, divided by shallow fissures into irregular ridges and plates; greyish to dark brown, inner bark reddish.

LEAF Alternate; somewhat oblong or oval; length 3 to 6", width 2½ to 4"; usually seven lobed; lobes bristle-pointed and separated by rounded openings, extending at least ⅔ of distance to midrib giving leaf a very deeply cut or lacy appearance; bright red and hairy in early spring, turning green later, and a bright scarlet in autumn.



One-half natural size

FRUIT Bitter acorn taking two years to mature; length ½ to 1"; reddish-brown, often stripped and about half enclosed in cup.

RANGE Usually grows on dry ridges in southeastern part of state and as far north as Cass Lake, except on limestone soils; not abundant in Minnesota.

WOOD Heavy, hard, strong, coarse-grained and reddish-brown; used mostly for fuel and as an ornamental tree; easily grown from seed.

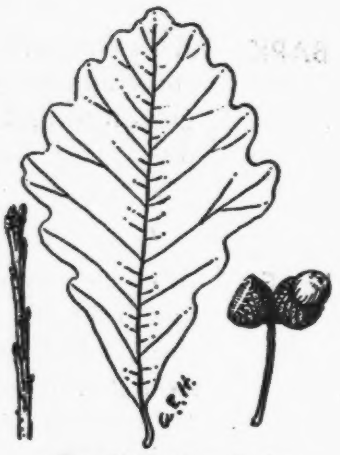
SWAMP WHITE OAK

[*Quercus bicolor*]

FORM Height may reach 65'; in general appearance much like that of true white oak.

BARK Thick, deeply and irregularly divided by fissures into broad ridges; greyish-brown; bark on twigs ragged and often peeling.

LEAF Length 5 to 6", width 2 to 4"; often crowded toward ends of twigs; broad at middle (pear-shaped) and wedge-shaped at base; wavy and indented along margin; dark green and shiny above, greyish and fuzzy beneath; turns brown in autumn.



One-third natural size

FRUIT Nut or acorn; length about 1", width ⅝", enclosed for about one-third of its length in thick, narrow cup. Usually in pairs on slender dark brown stocks which are 2 to 4" long.

RANGE Common in river bottoms in extreme southeastern corner of state and in southern part of Minnesota River Valley; rarely grows as far north as St. Paul; requires moist soil, as name implies.

WOOD Light brown, hard, strong, tough and durable; commercially, its uses and properties are similar to white and burr oak.

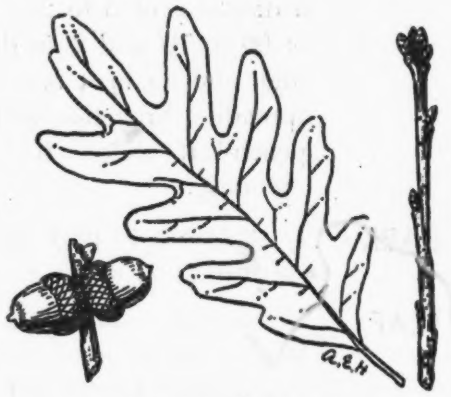
WHITE OAK

[*Quercus alba*]

FORM Height 60 to 100′, diameter 2 to 3′ and may become larger. Tall and naked in forest; short in the open, and crowned by broad, rounded top with limbs spreading irregularly; well-grown specimens are strikingly beautiful.

BARK Pale grey, scaly, but not deeply fissured; astringent and sometimes used in medicine and for tanning.

LEAF Alternate; length 5 to 9″ and about half as broad; crowded toward ends of twigs, deeply divided into 5 to 9 finger-like lobes; young leaf soft, silvery-grey, and yellow or red while unfolding, later becoming light green above and much paler below; sometimes remains on tree most of winter.



One-third natural size

FRUIT A light brown acorn maturing the first year; length ¾ to 1″, about ¼ enclosed in warty cap; germinates in a few weeks after ripening and falls to ground sending down a long, deep root before winter.

RANGE Abundant in southeastern Minnesota as far north as the Twin Cities, often forming woodlands almost to the exclusion of other trees; less abundant northward to Mille Lacs and northwestward to vicinity of St. Cloud; absent from northern and western parts of the state; grows on heavy, well-drained acid soil; slow growing; difficult to transplant after passing seedling state. A fine permanent tree that should be planted wherever the soil is suitable.

WOOD Light brown; hard, durable; one of our most useful woods for heavy construction; used for ships, railway ties, interior finish, furniture, and fuel.

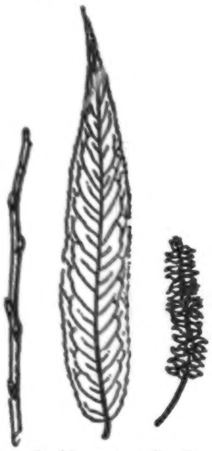
WILLOW

[*Salix species*]

FORM A large family of trees and shrubs, some varieties not commonly distinguished from each other; become large when growing along streams and other moist places; scraggly, dwarfed shrubs when growing in drier, less favorable sites. The black and peach-leaf willows are native, and the white and crack willows were originally foreign or exotic. On favorable sites, some trees are often 35 to 50' high, with a diameter of 6 to 24". The peach-leaf willow may attain a height of 60 to 70' and 2' in diameter. The black willow may be 30 to 40' high and again it may be only a shrub; usually short trunk, stout, spreading branches, and a broad, rather irregular open crown. The peach-leaf willow is somewhat greenish-yellow; twigs somewhat drooping.

BARK Dark brown to grey on large trees; thick, rough, furrowed and flaky.

LEAF White willow and crack willow leaves—whitish on lower surface; crack willow—recognized by large saw-toothed leaves and twigs that crack or break from branches very easily; white willow leaves—smaller, finely toothed, and often permanently silky; black willow—very narrow leaves, green on both sides; peach-leaf willow—long, pointed, lance-shaped leaves, whitish underneath, borne on long, slender, somewhat twisted stems.



One-half natural size

FRUIT Flowers in dense, elongated clusters known as "catkins"; flowers usually appear with leaves in spring. Willows may be propagated with "cuttings" more easily than with seeds. Seeds are minute, maturing in late spring or early summer.

RANGE Many varieties occur over a wide range in Minnesota and the United States from moist conditions to dry upland prairies. Many European and ornamental varieties have been introduced.

WOOD Light brown, soft, weak, flexible, coarse-grained; thin, whitish sapwood used for fuel, erosion control, and ornamental planting, windbreaks, baseball bats, and charcoal; large, good trees with straight grain are used in the manufacture of artificial limbs.

Forestry Briefs

Thirty-one and a half million acres or 62% of the area of Minnesota was originally forests. Today we have two-thirds of that area in forest land including old and second growth timber and pulpwood and areas which are being restored to timber through natural reforestation and the planting of trees.

Selective cutting means that trees are harvested in such a manner that the land is left in a productive state which will allow the cutting of future crops of timber. In our state forests this has been done, is being done and will continue to be done.

When trees are crowded each one seeks to outgrow the other in order to secure more sunlight. That is why trees in a dense forest are usually straight and free of low limbs. Trees in the open are rounder with limbs extending in all direction.

State timber appraisers and forestry personnel supervise the cutting of all state-owned timber. By enforcing sound forestry practices, ample timber is left to produce another crop and to insure sufficient game cover.

Trees help store rainwater and melted snow in underground reservoirs so that it will flow evenly into our lakes and streams and hold ground moisture for agriculture.

In a well managed forest you will find trees of all sizes varying from small seedlings to trees large enough to be sold for pulpwood or saw timber.

"Hardwood" does not necessarily mean the wood of the tree is hard. It is simply a term meaning broadleaf trees.

All characteristics of young plants differ from those of older trees, a fact which makes young trees difficult to identify.

Care and Planting of Trees

To obtain the best results, trees should be planted when they are dormant. This is evident by the closed buds on evergreens and by a leafless condition on hardwoods. Spring planting is preferred because growing conditions are better. Trees respond to care and soil conditions the same as farm crops. The better the soil, the better the growth. Soil preparation may be accomplished well in advance of the actual planting. If a tree is to be set in sandy soil, place enough heavy soil around the tree roots to increase the water-holding capacity of the sand. If the soil is heavy clay, mix sand with it to make it more porous to permit oxygen to percolate into the soil with the rain.

Trees should be planted to the same depth they originally stood in the nursery. The tendency is to plant large trees. This is a mistake. The shock of transplanting to a small tree is not as great as that to a larger tree. At the end of three or four years young seedlings will have outgrown the larger planting stock. Be sure to obtain trees that have just recently been dug from the nursery; the importance of the period between the time a tree is dug until it is again placed in the ground cannot be over-emphasized. Exposure of tree roots to hot sunlight and drying winds for three to five minutes may be fatal. If the bark is at all shriveled, it is an indication of excessive drying out of the tree and possible cell collapse.

In placing dirt around the roots, first put in a little fine dirt, then water, then dirt and so on. This method is called "puddling in." Roots should be fanned out similar to their original positions and should not be crowded.

Mature trees should be carefully pruned when planted to bring about a balance between the crown and the roots. Conifers should never be pruned by an amateur. Sod should be cleared at least two feet from the trunk and the area mulched or loosened frequently after planting to conserve moisture so necessary for good growth.

Ray Clement

Ray Clement, ***in charge of nurseries and planting.***

Planting Steps

1. Decide what you want your tree to do for you and select one that fills your needs. Give careful thought to the planting site.

2. Spring planting of trees will give the best results, with early fall the second choice. Spring planting may be started as soon as frost is out of the ground and may continue as long as the trees to be planted have not started new growth. Fall planting should not be started until the nursery stock has stopped growing and has become practically dormant. Small trees, six to twelve inches in size, will recover from the shock of transplanting more readily than larger trees.

3. Strong, healthy trees, as well as good planting practices, are most essential to good results in planting.

4. The period between the time of digging the trees in the nursery and the time of planting is a most critical one. Anything that can be accomplished to shorten this period will increase the chances of survival of the trees.

   a. Do not leave trees in freight or express offices for long periods.

   b. Water tree bundles immediately on arrival.

5. Exposure of coniferous tree roots to hot sunlight and drying winds for three to five minutes may be fatal. While trees other than coniferous trees will survive if their roots are dry, they will do much better if drying is not allowed to occur.

6. Plant trees within 24 hours of receipt. If this is impossible, it will be necessary to "heel" them in the ground, or to place them under refrigeration. "Heeling in" the small trees means placing them in a trench deep enough to cover the entire root system with the leaf area above the ground and tamping the soil firmly around the roots. Keep trees in a cool, shady place. Use ice,

if available. In preparing the heeling-in trench, make it deep enough to take the entire root system without bending the roots. Roots should not be so dense but that the soil can filter down through and be in contact with each and every root. Keep well-watered.

7. In digging from "heeled-in" stock, do not take up more trees than can be planted in one-half to one hour. In planting trees, carry all stock in a pail which will permit enough water to keep all roots covered during the entire time the trees are out of the ground.

8. Planting of small trees is usually accomplished through the use of one of the following methods:

- a. *The hole method.* The hole should be large enough to permit spreading of the roots without crowding or bending.
- b. *The slit method.* This is faster than the hole method; but compress roots in one plane and use only in loose, workable soil.

9. Avoid air pockets around or below the roots. Compress soil firmly around roots of newly planted trees.

10. Trees respond to cultivation as does any crop.

11. Weeds or grasses retard tree growth.

12. Fire will kill or weaken trees. Insects and disease follow fire and attack scarred or weakened trees.

Trees for Schools

Correlation of conservation throughout the entire school curriculum is one of the surest and most lasting ways of teaching conservation. Children from first grade throughout high school are naturally interested in growing things and are quick to grasp the significance of conservation.

Practical lessons in forestry have been added to the curricula of several schools throughout the state. Thoughts must be given in outlining the year's conservation project to insure care of planted trees during the summer vacation.

The ordinary country school finds many an outlet for practical projects. A corner of the school yard may be made into a bird sanctuary by planting trees, vines, and shrubs.

Many schools need wind-breaks. Quick-growing, effective windbreaks include hedges and evergreens on the outside border with tall-growing trees for the center. If the outside rows include hackberry, chokecherry, cedar and honey locust, it also serves as food and protection for birds and animals, thus bringing observation close to school windows.

Conservation speakers on school programs should be well-informed on present-day conservation and not dwell too long on the mistakes of the past. Changing land use has made it impossible, and in many instances, undesirable, to restore the amounts and kinds of wildlife enjoyed by our grandfathers. Our chief task now is to teach our children that true conservation never cuts into the capital of our natural heritage but uses only part of the surplus, thus accumulating stocks that will pay rich dividends to all. This is the lesson every Minnesota school child must learn well.

Many schools throughout Minnesota are cooperating with the Division of Forestry in large-scale planting programs. Some school systems have gone so far as to make the planting of trees a county-wide project.

The school forest at Gnesen in St. Louis county is an example of practical conservation accomplishments. Removal of dying trees and debris produced about 100 cords of fuel wood for use in the school. The 30 acre plot is being replanted with seedling trees from the school nursery developed entirely by the school children.

The privileges of tree distribution by the Minnesota Division of Forestry were expanded considerably by the 1947 Legislature. The Division may now furnish trees for planting upon public or privately owned lands.

This change in the nursery laws now permits of the distribution of coniferous and deciduous trees for use in all phases of conservation work. Trees are distributed at approximately cost for planting upon private lands, while public lands may receive trees for the cost of transportation from our nurseries.

DO YOU KNOW THAT–

Two-thirds of the area of Minnesota is forest land?

The timber industry of Minnesota is of more benefit to the rank and file of the people of the state today than was the harvesting of the cream of the crop in early logging days?

"Selective cutting" of state timber leaves the land in a productive state which will allow the cutting of future crops of timber?

The auxiliary forest law provides that certain tracts of land may be dedicated to forestry purposes with a small fixed tax per acre paid each year upon establishment and the main tax collected when the timber crop is cut?

Pulpwood can be grown in 20 years, cross ties in 30 years and saw logs in 40 years?

By enforcing sound forestry practices ample timber is left to produce another crop and to insure sufficient game cover?

Forest camp grounds in our state forests serve to concentrate campers in small developed areas thereby reducing the risk of fires?

The forest protective area in Minnesota is divided into 16 supervisory areas, each of which is divided into ranger districts?

How to Establish a Community Forest

1. See presidents of various organizations in the community. Include businessmen's and farmers' organizations, women's clubs, sportsmen's organizations, patriotic organizations, civic clubs, religious societies, fraternal orders and members of community government. Explain to each the uses of community forests and their value to the community in helping to rebuild natural resources.

2. Call a meeting of the representatives of the organizations contacted as well as other public-spirited citizens. The Minnesota Department of Conservation will be glad to furnish a speaker for such meetings.

3. At the meeting, select a nominating committee to draw up a list of committees and their duties.

   a. ***Land acquisition committee*** to see citizens who might be interested in creating a memorial by donating land or money toward the purchase of land. Contact state and county officials about tax-delinquent and other lands that might be of greater service if converted into a community forest.

   b. ***Forest trustee committee*** to contact the State Division of Forestry about developing a plan of management and use of the forest. Obtain necessary labor.

   c. ***Legal committee*** to study ways and means of setting up a permanent committee of forest trustees that can give continuous management to the community forest without being affected by changing administrations.

Recent legislation has made it possible for county boards to set aside certain lands for conservation purposes with the approval of the conservation commissioner, thus clearing the way for the establishment of community forests and planting sites in counties, municipalities, school districts and townships.

The careless hunter smokes while traveling in the woods; shoots at a noise in the brush; brings a loaded gun into camp; builds a big campfire in unsafe places; points his gun at companions, and guesses that his campfire is out.

Food and Cover Plantings for Wildlife

The most necessary work to be done in Minnesota for better conservation of upland game is permanent food and cover planting.

During the summer months game birds consume berries, succulent vegetation and insects. In winter months they resort to buds, twigs, seeds, acorns, nuts and dried fruits. Obviously, the wider the variety of trees and shrubs in an area the greater the source of food supply for game birds.

Food-bearing trees, valued by wildlife include: oak, walnut, bluebeech, ironwood, basswood, poplar, birch, mountain ash, locust, willow, cherry trees and the like.

Vines, including bittersweet, grape, Virginia creeper and smilax are of great value.

Shrubs are most important of all. For example, the sand cherry grows readily on poor soil and bears fruit close to the ground easily reached by game. Shrubs that might well be planted for the benefit of wildlife include: wolfberry, hazelnut, dogwood, bladdernut, hop, rose, buttonball, native holly, sumac, thornapple, prickly ash, and such berries as cranberry, dewberry, raspberry, snowberry, elderberry and blueberry.

Small evergreens are important for cover, shielding game from winged predators and from wet and drifting snows.

Triangular planting is recommended since this plan permits sunlight to strike each side of the stand throughout every season of the year.

Sportsmen of Minnesota are giving increasing attention to permanent food and cover planting for wildlife. With the continuance of such programs the game life will be able to hold its own and increase in numbers, and the annual planting of grain-food-plots for winter food can be gradually eliminated, as well as artificial feedings.

Frank D. Blair

Frank D. Blair,
Director, Division of Game and Fish

How to Prevent Forest Fires

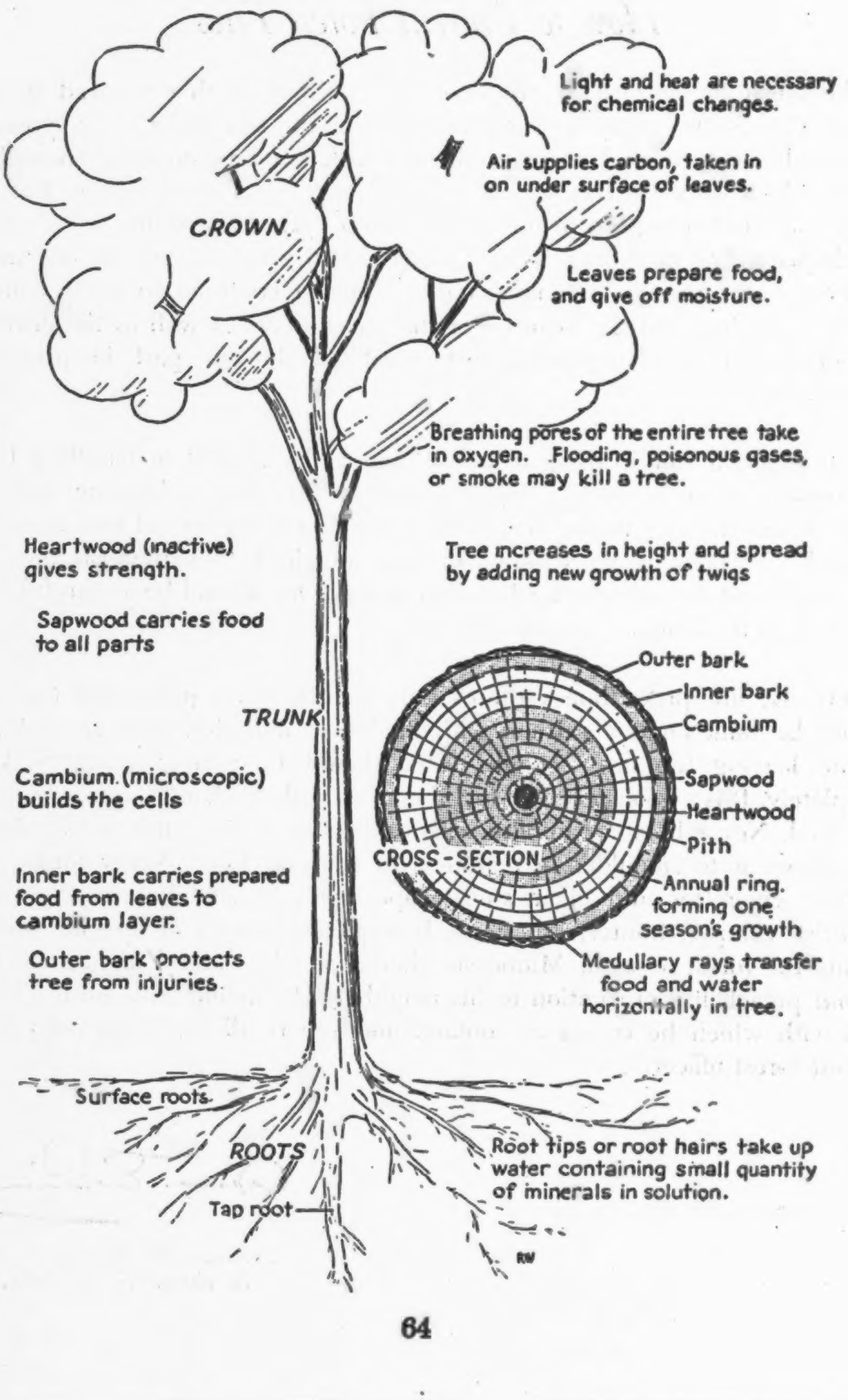
The forest fire hazard in Minnesota is extremely high compared to other states. This is due to our geographic location, the soil and timber types, the topography and general climate, all of which combine to create conditions under which fires start easily and spread rapidly. Particularly is this true in the vast timber regions in the north central part of the state.

Adequate fire protection is the basis of all conservation. If we are to preserve our forests—which means if we are to continue to enjoy hunting, fishing, camping, and the beauties of the out-of-doors as well as the economic advantages of woods industries—we must all do our part in preventing forest fires.

It seems a simple thing to ask a man to be careful in handling fire in the woods. Scarcely anyone would think of throwing a burning match or cigarette on the rug in the home of a friend; neither would one stand idly by and see such an act without making an effort to extinguish the blaze and reprimand the offender for his carelessness. One should be as careful in the woods as in the home.

Actually, fire prevention requires only a little good judgment. Campfires should be built on mineral soil with all leaves and duff well cleared back. Before leaving the fire, enough water should be poured on it to kill it completely. It is a good policy to feel the ashes with the hand to make sure they are dead. Never bury a campfire with duff or litter since this only holds the fire, allows it to smoulder in readiness to start up later. Never throw away burning cigarettes and cigar stubs, pipe ashes or matches in the woods. Motorist, camper, hunter, fisherman, berrypicker, farmer or anyone who frequents the forest areas of Minnesota should *first* be careful of himself, then, *second* preach fire prevention to his neighbor. He should extinguish all small fires with which he comes in contact, and report all the large ones to the nearest forest officer.

Anson E. Pimley,
in charge of fire prevention.


CROWN.
Light and heat are necessary for chemical changes.
Air supplies carbon, taken in on under surface of leaves.
Leaves prepare food, and give off moisture.
Breathing pores of the entire tree take in oxygen. Flooding, poisonous gases, or smoke may kill a tree.
Heartwood (inactive) gives strength.
Sapwood carries food to all parts
Tree increases in height and spread by adding new growth of twigs
TRUNK
Outer bark
Inner bark
Cambium
Sapwood
Heartwood
Pith
Cambium (microscopic) builds the cells
CROSS-SECTION
Annual ring. forming one season's growth
Inner bark carries prepared food from leaves to cambium layer.
Outer bark protects tree from injuries.
Medullary rays transfer food and water horizontally in tree.
Surface roots.
ROOTS
Root tips or root hairs take up water containing small quantity of minerals in solution.
Tap root
RW

You Violate A Forest Law If You—

1. Leave a fire unquenched near forest, brush or prairie land.
2. Carry a naked torch or exposed light in the woods.
3. Throw or drop a burning match, lighted cigarette or cigar or pipe ashes.
4. Drive over forest lands without a muffler on the exhaust pipe of your car or tractor.
5. Burn without a permit
6. Refuse to fight a forest fire.
7. Fail to report a fire.
8. Allow a fire to spread.
9. Cut state timber without valid permit.
10. Fail to clear the ground of combustible matter with in a radius of five feet from a campfire.
11. Fail to report timber cutting.

The destruction, injury, or defacing of any sign, guide post, building or property of any kind belonging to the state is unlawful.

Acknowledgments

The illustrations used in this bulletin were furnished by the Forest Service, U.S. Department of Agriculture, for which we give grateful acknowledgment.

The source material used is "Trees and Shrubs of Minnesota" by Rosendahl and Butters, and "What Tree Is That?" by E. G. Cheyney, University of Minnesota.

Members of the Department of Conservation who assisted in the preparation of this booklet and to whom acknowledgment is due are Roger Williams of the Division of Forestry for the map and tree design, and Raymond Clement, and Elizabeth Bachmann, Division of Forestry, for compiliation and editing.

PREVENT FOREST FIRES

Report all unattended fires to the nearest forest officer or local telephone operator.

The following is a list of stations where rangers are located during the fire season:

Aitkin
Backus
Badoura Nursery
Bagley
Baudette
Bemidji
Big Falls
Birchdale
Blackduck
Borden Lake
Brainerd
Cambridge
Cass Lake
Cloquet
Cloquet Valley
Cotton
Crane Lake
Cromwell
Deer River
Duluth
Eaglehead Tower
Elbow Lake
Emily
Eveleth
Floodwood
Finland
Grand Rapids
Hibbing
Hill City
Hovland
Itasca Park
Kabetogama
Littlefork
Loman
Moose Lake
Nimrod
Northome
Onamia
Orr
Park Rapids
Pequot
Pinewood
Smoky Hills Tower
Sturgeon Lake
Tower
Warroad
Waskish
Willow River Nursery

KEEP MINNESOTA GREEN

For discussion purposes only

A PARTIAL LISTING OF PRESENTLY OWNED

SCIENCE MOTION PICTURE FILMS

for
Grade Seven

Correlated to the Major Topics as found in the
Reorganized Science Curriculum

Minneapolis Public Schools
Science Department
5-18-66

TABLE OF CONTENTS

Major Topic	Page Number	Color
Introduction to Science	1	Gray
II. Living Things		
Plants and Animals	5	Green
Plants	16	Green
Animals	26	Green
Human body	60	Green
I. The Earth		
Water	75	Pink
Air	81	Pink

The annotations for films found on the following pages were obtained in most cases from the Library of Congress cards. Some annotations were secured from other sources such as the Educational Film Guide and producers' catalogs.

Introduction to Science

Name and Description of Film	Other Grade Placements	Remarks
1. Aristotle and the Scientific Method ** Coronet, 1959; 14 min. Describes the achievements of science in the ancient world, stressing Aristotle's contribution to the development of the scientific method. Explains how Aristotle, departing from Plato's ideas made observations based on his experience, classified his data, performed experiments, and sought to arrive at generalizations or principles. Illustrates how his work laid the foundations for such sciences as botany and zoology.		
2. Audubon and the Birds of America ** Coronet, 1957; 16 min. The life and work of the artist and naturalist, John James Audubon. Depicts the development of his intense interest in painting wildlife, and his efforts to combine this dedication with his business ventures as an adult. Shows scenes of his business and personal life, and of his eventual successful publication of The Birds of America.	Gr. 4 - **	
3. Duck Hunters Dilemma ** U of M, 1951; 20 min., color Shows the nature and extent of present (1951) waterfowl problems. Follows game biologists in the field as they work on five waterfowl experiments, and presents conclusions and findings from this research. Includes pictures of waterfowl in their natural surroundings.		

* Good
** Excellent

Introduction to Science (continued)

Name and Description of Film	Other Grade Placements	Remarks
4. Health Heroes: The Battle Against Disease ** Coronet, 1959; 11 min. Highlights the outstanding contributions of five pioneers in medical science. The discovery of bacteria by Leeuwenhoek; the development of vaccination by Jenner; Pasteur's discovery of the source of bacterial infection and how to destroy germs; isolation and growth of disease germs by Koch; Lister's discovery of disinfection.	Gr. 4 - **	
5. Quality Control in Modern Merchandising * John Sutherland, 1952; 25 min., color Shows the machines and methods that test the toughness, durability, and overall standards of shirts, sheets, blankets, shoes, trousers, and other articles.		
6. Rainbow Valley: The Story of a Forest Ranger ** U.S. Dept. of Agric., 1954; 28 min. Portrays the work and responsibilities of U.S. forest rangers, and the benefits of the National forests in terms of timber, water, grass, wildlife, and recreation.	Gr. 7 - Gr. 10 - **	Also listed plants & animals
7. Science and Superstition ** Coronet, 1947; 11 min. Illustrates the use of the scientific method in working out everyday problems and reaching conclusions based on research and experimental evidence. Shows how science disproves superstitions about the groundhog, rabbit's foot, etc.	Gr. 5 - **	

* Good
** Excellent

Introduction to Science (continued)

Name and Description of Film	Other Grade Placements	Remarks
8. Scientific Method ** EBF, 1954; 12 min., color Explains the elements of the scientific method of problem solving, and the way this method is applied by scientists. Discusses the value of scientific thinking in dealing with problems of everyday life. Features the discovery of penicillin by Sir Alexander Fleming and the work of Louis Pasteur as illustrations of contributions of scientific thinking to modern knowledge.		
9. Truth About of Fluoridation * Capital Prod., 1957; 11 min., color Explains the process of fluoridation and the scientific research which led to this new public health measure.	Gr. 10 - *	
10. Understanding Vitamins ** EBF, 1952; 14 min., color Describes the scientific research which has been conducted in determining the role of vitamins; explains what vitamins are, how they work, and why they are necessary for good health; describes the natural sources of vitamins; and explains how vitamin deficiencies in the diet can be supplemented by the use of synthetic vitamins.	Gr. 10 - **	

* Good
** Excellent

Introduction to Science (continued)

	Name and Description of Film	Other Grade Placements	Remarks
11.	Vacant Lot Int'l Film Bureau, 1962; 21 min., color The relationships of wild flowers and common weeds, plant-eating insects and their predators, amphibians, reptiles, song birds and mammals are studied as they contribute to the dramatic balance of nature. The ecology of the vacant lot is treated broadly so that essential ecological principles may easily be related to similar areas in other regions, including urban areas.	Gr. 7 - Gr. 4 - ** Gr. 10 - **	No eval. yet Difficult
12.	What is Science? ** Coronet, 1947; 11 min. Explains that science is knowledge of the world about us. Two children, curious about common phenomena, conduct simple experiments and find their answers by using the scientific method; by observing, experimenting, drawing conclusions, and testing the results.	Gr. 5 - **	

* Good
** Excellent

II. Living Things

Plants and Animals

Name and Description of Film	Other Grade Placements	Remarks
1. **Arctic Borderlands in Winter** **	Gr. 4 - ** Gr. 10 - *	
Coronet, 1948; 11 min.		
Dramatizes the adaptation of plants and animals to living conditions just south of the Arctic Circle. Records the migrations and color changes of animals preparing for the winter.		
2. **Asexual Reproduction** **	Gr. 10 - **	
Ind. Univ., 1960; 10 min., color		
Illustrates and explains the nature of asexual reproduction in living forms, using still pictures, live and time-lapse photography, cinephotomicrography and animation. Distinguishes between sexual and asexual methods of reproduction and depicts the basic similarity of all types of asexual reproduction and shows the degree of variability to be expected by asexual and sexual reproduction.		
3. **The Cell--Structural Unit of Life** **	Gr. 5 - **	
Coronet, 1949; 11 min.		
Shows the basic relationship of our living bodies to other living organisms in the world. Presents through photomicrography the living protoplasm on a leaf cell, and the amoeba taking food, growing, and dividing. Explores also the functional differences in cell structure.		

* Good
** Excellent

Plants and Animals (continued)

	Name and Description of Film	Other Grade Placements	Remarks
4.	Challenge of the Oceans ** McGraw-Hill, 1961; 27 min., color Explains scope and objectives of present day oceanographic exploration.	Gr. 8 -	No eval. yet
5.	The Changing Forest ** McGraw-Hill, 1958; 19 min. Presents the ecology of a deciduous forest area of the type found along the southern fringes of the Laurentian Shield, showing the forest as an integrated community of living things, both plant and animal, balanced by conflict as well as harmony in the never-ending struggle for survival.	Gr. 4 - ** Gr. 10 - **	
6.	Characteristics of Plants and Animals ** U of Ind., 1954; 10 min., color Surveys living organisms with emphasis on three concepts: that all life comes from pre-existing life; that plants and animals, microscopic and macroscopic, in all classifications, have common basic characteristics; and that the cell is the structural unit of life at all levels.	Gr. 5 - ** Gr. 10 - **	
7.	Fall Brings Changes Churchill-Wexler, 1962; 11 min., color This film shows the adaptation of plants and animals to colder weather. Useful in the area of Language Arts. It is beautiful and poetic and will inspire many stories to enrich the child's imagination and vocabulary.	Gr. 7 - K - ** Gr. 1 - ** Gr. 2 - ** Gr. 4 - **	No eval. yet

* Good
** Excellent

Plants and Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
8. Heredity and Environment ** Coronet, 1951; 11 min. Defines heredity as the determining factor in certain of our basic capabilities and environment as a force which helps determine the extent and direction of our use of those capabilities. Surveys cultural inheritances, genetics, environmental influences, and their interrelationships.		
9. Insect Food ** Pat Dowling, 1958; 14 min., color Close-up photography illustrates the variety of foods consumed by different insects. Damage done by insects to trees, grain, plants, furniture, clothes, and rugs is shown. Insects that eat other insects are shown at work--praying mantis, ant lion, etc.	Gr. 5 - ** Gr. 10 - **	
10. Insect Mounting and Preserving ** Pat Dowling, 1961; 14 min., color Illustrates techniques in a dozen different ways of mounting and preserving varieties of insects in close detail. As a suitable companion film to the subjects "Insect Foods" and "Insect Collecting" which are also described in this catalog; the film should serve to stimulate constructive leisure-time activities and interest in this branch of science.		
11. Life Along the Waterways * EBF, 1952; 11 min., color Shows the variety of environmental conditions in a changing waterway. Includes scenes of animal and plant life found in streams, ponds, rivers and marshes.	Gr. 3 - ** Gr. 4 - **	

* Good
** Excellent

Plants and Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
12. Life in a Pond ** Coronet, 1950; 11 min., color Discloses pond life in action, providing examples of important principles of natural science. Shows in microscopic and underwater scenes the variety of self-sustaining plants and animals found in a typical fresh water pond, among them the shoreward, floating, and submerged green plants and water fleas, beetles insect larvae, dragonfly nymphs, and minnows.	Gr. 4 - ** Gr. 5 - ** Gr. 10 - *	
13. Life in the Ocean ** Film Associates of California, 1963; 16 min., color This film presents an overview of the plants and animals of the sea. The relationships of marine forms to each other, to their environment, and to similar living things found on land is emphasized. Plants and animals of shore, shallow water, and ocean depths are examined in some detail.	Gr. 4 - ** Gr. 8 -	 No eval. yet
14. Microbes and Their Control ** Film Associates of California, 1963; 13 min., color Microbes are living things too small to be seen with our eyes alone. There are many different kinds of microbes: some are animals and some are plants. Microbes are all around us, and they can be both helpful and harmful to us. In order to grow and multiply, microbes need food, moisture, and warmth. When we want them to grow, we give them food, moisture and warmth. To control their growth, we keep these necessities from them.	Gr. 4 - **	

* Good
** Excellent

Plants and Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
15. Microscopic Life: The World of the Invisible ** EBF, 1959; 14 min., black & white Describes forms of microscopic life commonly found in a jar of ordinary pond water. Identifies each plant and animal by name, ending with a series of scenes of diatoms, tiny plant forms of unusual beauty. Time-lapse photography shows the reproduction of a desmid, another one-celled plant.	Gr. 10 - **	
16. Mysteries of the Deep ** Walt Disney, 1961; 24 min., color Presents glimpses of the mysterious life below the surface of the sea. Pictures animals that live at different levels of the sea, especially those animals that live on the rocky reefs at the bottom. Depicts plumed sea slugs being eaten whole by the giant slug, navanax; predatory fish having their scales cleaned by French Angel and Barbershop Shrimp; ballet of the Squirrel Fish at mating time; Grunt's kissing ritual; miracle of birth of the dolphins, sea horse and octopus. Emphasizes the struggle for survival of the creatures that inhabit the reefs.	Gr. 4 - Gr. 8 -	No eval. yet No eval. yet
17. Nature's Half Acre ** Walt Disney, 1956; 33 min., color This film shows all of the millions of inhabitants of the tiny grass-roots world in any half acre and how the balance of nature is maintained. Sequences in nest building, feeding the young and the activity during the four seasons of the year are interestingly presented.	Gr. 4 - ** Gr. 10 - *	

* Good
** Excellent

Plants and Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
18. Nitrogen Cycle * United, 1955; 14 min., black & white Illustrates the cycle through which nitrogen passes in changing from free nitrogen in air, to compounds in the soil, to plant and animal protein, and to free nitrogen in the air again. Uses animated drawings to describe this cycle. Explains the reasons for the use of forage crops as animal food and fertilizer, and points out the similarity between making fertilizer in the factory and the natural process of creating nitrogen compounds.	Gr. 10 - *	
19. Osmosis ** EBF, 1958; 14 min. The process of osmosis as it applies to plant growth. Animation and time-lapse photography demonstrate movement of molecules, and diffusion of gases and liquids. Shows how the process of osmosis depends upon nature of the membrane, temperature of the solution, and concentrations of solutions. Experiments with living plants.	Gr. 9 - ** Gr. 10 - **	
20. Paper and Pulp Making Coronet, 1955; 11 min., color Presents an overview of paper and pulp making, one of the largest industries of the United States. Shows important factors in locating pulp and paper plants near the tree sources and available to a water supply. Describes methods used in changing wood to pulp and processing pulp to make paper. Shows workers involved in the process of moving from raw materials to the finished product. Stresses how the industry protects its tree supply through reforestation. Concludes by stating that pulp is used in many other products.	Gr. 7 -	No eval. yet

* Good
** Excellent

Plants and Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
21. Partnerships Among Plants and Animals ** Coronet, 1960; 10 min., color Uses a variety of examples to show the interdependence of plant groups, animal groups, and plant - animal groups. Examples illustrated include ants and aphids, hermit crab and byrozoames, algae and fungi, in lichens, red clover and nitrogen-producing bacteria, and red clover, and the bumble bee.	Gr. 4 - *	
22. Pioneer Spinning and Weaving ** Ind. Univ., 1960; 10 min., color Illustrates how linen, wool and linsey-woolsey fabrics were made from materials found or grown on the farm. Shows how flax was processed into linen thread from harvesting through retting, drying, braking, switcheling, hatcheling, and finally to the actual spinning of linen thread. The shearing of sheep, cleaning and carding of fleece and the spinning of woolen thread are also pictured in detail. Weaving and dying of cloth are shown.	Gr. 4 - **	
23. The Pond IFB, 1962; 20 min., color Examines a community of living things in the environment of a pond and shows how each living organism above and below the water is related to a light, mineral water requirement. Uses close-ups and on-the-spot recorded sound to survey the wild-flowers and plants which provide food and shelter for an abundant animal life of invertebrates, fish, amphibians, reptiles, birds, and mammals. Stresses that the pond influences much of the countryside and that there is a slow process of evolution and adaptation which is sheltered and protected in the environment of the pond.	Gr. 7 - Gr. 4 -	No eval. yet No eval. yet

* Good
** Excellent

Plants and Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
24. Rainbow Valley: The Story of a Forest Ranger ** U.S. Dept. of Agric., 1954; 28 min. Portrays the work and responsibilities of U.S. forest rangers, and the benefits of the National forests in terms of timber, water, grass, wildlife, and recreation.	Gr. 7 - Gr. 10 - **	Also listed Introduction
25. Spring Comes to the Subarctic (Canada's Churchill Region) ** U of M, 1955; 15 min., color Shows plant and animal life in the subarctic and portrays the changes which occur as spring comes to the northern region of Canada. Includes detailed scenes of native plants, and close-ups of birds of the area.	Gr. 4 - ** Gr. 10 - **	
26. A Strand Breaks * EBF, 1950; 16 min., color Portrays the effects of a state of imbalance in nature. The destruction of a community, as a consequence of one element's getting out of hand is traced in regard to forest and grassland. Explores the results of overgrazing and hunting, and points out that only by intelligent management can man secure his heritage of the soil.	Gr. 10 - **	

* Good
** Excellent

Plants and Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
27. The Strands Grow ** EBF, 1950; 14 min., color Uses fossil remains and other prehistoric relics to point out that the communities of plants and animals which had existed on earth were replaced by others when they failed to adjust themselves to changes in their environment. Shows in detail the growth and development of the climax forest to emphasize the meaning and significance of a state of balance.	Gr. 10 - **	
28. This Vital Earth ** EBF, 1948; 11 min., color Shows the interdependence of plant and animal life and the consequences of man's misuse of natural resources. Includes animated drawings.	Gr. 4 - * Gr. 10 - **	For mature child
29. What's Alive ** Film Assoc. of Calif., 1962; 10 min., color Helps the student toward an understanding of the activities that distinguish living from non-living things. Defines living things in terms of a set of activities. This print shows that only a thing that can move, respond, change fuel into energy, reproduce and grow can be said to be "alive".	Gr. 3 - ** Gr. 4 - ** Gr. 5 - **	

* Good
** Excellent

Plants and Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
30. What's Under the Ocean ** Film Assoc. of Calif., 1959; 13 min., color Scientists study the ocean in many ways. Some take cameras to study plants and animals in shallow depths. Some go to the deepest ocean floor in special craft-like abathyscaph. Some use instruments on research ships to study bottom materials and to map vast areas of the ocean floor. They have found a long mountain range dividing the Atlantic in two and in the Pacific thousands of volcanoes and many deep trenches.	Gr. 4 - ** Gr. 8 - ** Gr. 7 -	Also listed Water
31. World at Your Feet ** Int'l Film Bureau, 1953; 22 min., color The soil is shown as a veritable thriving community in miniature, populated by living things of the animal, plant, and insect worlds, some draining the soil of its usefulness, others contributing to its productiveness. Deals extensively with soil substance, analyzing different types of soil structure and their resistance to varying natural conditions. Suggestions are made as to how man can make his own contributions to the good of the earth.	Gr. 8 - ** Gr. 10 - **	
32. World in a Marsh ** McGraw-Hill, 1956; 22 min., color Examines the strange floating world of the marsh. Probes into the life forms that dwell beneath the water's surface, and watches the creatures that choose the cool green jungle of weeds and swamp lilies for their habitat.	Gr. 4 - ** Gr. 10 - **	

* Good
** Excellent

SCIENCE MOTION PICTURE FILMS - Grade Seven
(Addendum)

Additions to
Page 15

II. Living Things

Plants and Animals

Name and Description of Film	Other Grade Placements	Remarks
Life Story of the Paramecium ** EBF (Basic Life Science) 1964; 11 min., color Remarkable microphotography provides a unique live-action study of the paramecium in its natural environment, showing life functions such as locomotion, feeding, digestion, excretion and reproduction.	Gr. 4 - **	
Radiation In Biology: An Introduction ** Coronet; 1962; 13½ min., color How high energy radiations effect living plants and animals is graphically demonstrated thru laboratory experiments in one of the nation's leading research laboratories. The concepts of natural radiation and artifically produced radiation are clearly explained, and the film shows the use of radioactive materials in treating cancer and in studying the processes of growth, nutrition and reproduction in living things.	Gr. 10 - *	Difficult for a few

* Good
** Excellent
5-9-67

Plants and Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
33. The Worlds of Dr. Vishniac Educ. Test Serv., 1959; 20 min., color Shows Dr. Roman Vishniac, entomologist and microbiologist, as he makes photographs and motion pictures of living things too small to be seen by the naked eye. Includes views showing the details of the structure of paramecium bursaria, of pleodorina, and an amoeba moving and eating.	Gr. 10 - **	Speech diff. to understand
34. Yours is the Land * EBF, 1950; 20 min., color Shows the role of topsoil, water, plants, forests, and animal life in the conservation of natural resources. Exposes the results of man's practice of taking too much from the earth in too short a time. Emphasizes the need for a system of orderly management of our natural resources.	Gr. 8 - ** Gr. 10 - **	

* Good
** Excellent

II. Living Things

Plants

Name and Description of Film	Other Grade Placements	Remarks
1. Apples, From Seedling to Market ** EBF, 1950; 11 min., color Uses the "Delicious" apple as an example to trace the major steps of apple growing and packing, from planting and grafting stages through shipment of the packaged fruit. Filmed in the Wenatchee Valley in Washington.	Gr. 2 - ** Gr. 4 - **	
2. Bacteria--Friend and Foe ** EBF, 1956; 11 min., color The film opens by describing some of the thousands of known bacteria and telling where they may be found. Points out that bacteria are growing plants and that they may be found associated with the roots of certain plants. That some bacteria may improve food or spoil food, some are harmful to man; others are beneficial, and still others are harmless.	Gr. 10 - *	
3. Blooming Desert (Flowering Desert) ** Bailey Films, 1947; 11 min., color Close-up photographs of wild flowers in the deserts of western United States. Musical score throughout.	K - * Gr. 3 - * Gr. 4 - *	Needs prep.

* Good
** Excellent

Plants (continued)

Name and Description of Film	Other Grade Placements	Remarks
4. The Colour of Life ** Nat'l Film Board of Canada, 1955; 24 min. Discusses the growth of a seedling, the seasonal upsurge of life in a giant forest tree, and the mysterious alchemy of a single leaf. Presents, in magnified dimension, the maple leaf and segments of the tree to illustrate the physiological processes that go on in all plants. Through detailed time-lapse photography and animated diagrams, reveals the silent, methodical ways in which nature makes the woodlands green in springtime and bright colored in autumn.	Gr. 5 - * Gr. 10 - **	Difficult
5. Flowers At Work * EBF, 1931; 11 min., black & white Explains the main function of flowers as that of producing seeds. Animated drawings describe the structures and functions of the sepal, petal, stamen, pistil, pollen, style, and ovary. Close-up and slow-motion photography depict different methods of pollination of various types of flowers and reveal the work of the bee in cross-pollination.	Gr. 5 - ** Gr. 10 - *	Adv. vocab.
6. Food From Our Garden ** EBF, 1952; 10 min., color Shows the members of a family working in their garden. Describes the structure and growth of plants; examines the plants of several common vegetables, pointing out in each the location of the edible portion and its function in the growth of the plant.	Gr. 1 - ** Gr. 2 - ** Gr. 4 - **	

* Good
** Excellent

Plants (continued)

Name and Description of Film	Other Grade Placements	Remarks
7. Forest Conservation ** EBF, 1949; 11 min., color Calls attention to the many ways in which man has depleted the forest by greedy and ignorant exploitation for his own gain. Forecasts the dire results of this exploitation if it is continued. Suggests what is being done, and what must continue to be done in order to save the forest and its vast resources.	Gr. 10 - **	
8. The Forest Grows: Part 1 ** EBF, 1949; 10 min., color Describes elements that contribute to the mature forest, emphasizing the unique contributions of each. Explains forest zones in relation to temperature and rainfall, and defines the phrase "climax forest" in terms of the species that predominate when the forest is mature.		
9. The Forest Produces: Part 2 EBF, 1949; 11 min., color Shows the development of forest resources. Describes timber and how it grows, explains the watershed's vast underground reservoir, and depicts the facilities of the forest for man's use in physical and spiritual recreation. Suggests ways in which these forest resources are threatened by man.	Gr. 7 - **	

* Good
** Excellent

Plants (continued)

Name and Description of Film	Other Grade Placements	Remarks
10. Forests and Conservation ** Coronet, 1943; 11 min. Shows how the Government and a lumber camp joined forces to save trees through a program of selective logging, reforestation and fire prevention. Includes a fire-fighting sequence.	Gr. 4 - **	
11. The Growth of Flowers * Coronet, 1945; 11 min., color Time-lapse photography shows the miracle of growth. Presents the rose, orchid, jack-in-the-pulpit, daffodil, and iris sprouting from the ground, growing, bursting into bloom, and dying.	Gr. 5 - * Gr. 10 - **	
12. Growth of Seeds ** EBF, 1957; 14 min. Combines graphic closeups with animated drawings and time-lapse photography to show sources from which plant seeds are obtained; describes the structure of seeds; and shows processes of germination and plant growth. Illustrates differences between flowering plants and seed plants.	Gr. 5 - ** Gr. 10 - **	Adv. vocab.
13. Life Cycle of a Plant ** United, 1950; 10 min., black & white Traces plant growth from seed to mature plant to new seed. Through time-lapse photography shows the processes of germination, growth above and below the soil, seed development, pollination and fertilization.	Gr. 10 - **	

* Good
** Excellent

Plants (continued)

Name and Description of Film	Other Grade Placements	Remarks
14. Life of a Plant ** EBF, 1950; 11 min., color Through time-lapse photography shows steps in the life cycle of a typical flowering plant, the pea. Identifies the roles of roots, stems, leaves, flower, fruit, and seed. Animated drawings reveal the functioning of the various parts of the plant.	Gr. 5 - **	
15. Lumber for Houses * EBF, 1952; 12 min. The story of lumber from trees to sawmill. Shows logging crews at work, principally in forests of the Northwest, cutting down trees with a chain saw, sawing the trees into logs, transporting the logs to a mill where the logs are debarked, trimmed, cut into boards before being sent to a planing mill.	Gr. 4 - *	
16. A Parasitic Plant * EBF, 1931; 10 min., black & white Describes the characteristics and life cycle of a typical parasitic plant, the dodder. Close-up and time-lapse photography reveal the flower with its ovary and seeds, and the movements of the dodder as it grows, gropes about, attacks, and entwines other plants, Cinemicrography demonstrates structure of the suckers, and animated drawings portray their parasitic action on a flax stalk.	Gr. 5 - ** Gr. 10 - *	

* Good
** Excellent

Plants (continued)

Name and Description of Film	Other Grade Placements	Remarks
17. Plant Survival ** United, 1950; 10 min., black & white Self-protective devices used in various stages of plant growth; defenses of flowers and leaves against damage by rain and animals; and in close-up views the protective devices of roots, seeds, buds, leaves and flowers.	Gr. 4 - ** Gr. 10 - *	
18. Plant Traps ** EBF, 1931; 10 min., black & white Examines the characteristics of two representative carnivorous plants revealing how they entrap and digest insects as part of their food. Close-up photography depicts the pitcher plant catching and drowning its prey, and the sun dew plant as its leaf tentacles enfold insects. Includes microscopic and time-lapse photography.	Gr. 4 - ** Gr. 10 - **	
19. Roots of Plants ** EBF, 1931; 11 min., black & white Describes tap, fascicled, and fibrous roots, and explains how they not only hold the plant in place but also absorb food elements from the soil. Through time-lapse photography, cinemicrography, animated drawings, and laboratory experiments, demonstrates root growth, sensitivity, wearing away of cells, and osmosis. Reveals how biennials store excess starch in their roots for use as food the second year.	Gr. 10 - **	

* Good
** Excellent

Plants (continued)

Name and Description of Film	Other Grade Placements	Remarks
20. Seasonal Changes in Plants ** McGraw-Hill, 1960; 11 min., color Illustrates and explains the various changes that take place in a plant through the cycle of the seasons, using typical examples of annuals, biennials, and perennials.	Gr. 4 - **	
21. Seasonal Changes in Trees ** Coronet, 1949; 11 min., black & white Children study the common trees near their school and note the seasonal changes which occur in the different varieties.	Gr. 1 - ** Gr. 3 - ** Gr. 4 - **	
22. Seed Dispersal ** EBF, 1931; 11 min., black & white Considers various means by which seeds are disseminated; how they anchor themselves to the ground to facilitate germination; and how they protect themselves. Demonstrates the dispersal of seed plants by wind, transportation by animals, and propulsion from seed cases. Describes anchoring methods by clamping, hooking, adhesion, and corkscrew motion. Portrays various natural devices for protection while sprouting.	Gr. 4 - ** Gr. 5 - ** Gr. 10 - *	
23. Spring Blossoms * Int'l Film Bureau, 1954; 20 min., color Time-lapse photography pictures spring flowers opening and growing. Among them are the azalea, camellia, hepatica, trillium, fern, May apple, foxglove, and buttercup.	Gr. 3 - ** Gr. 5 - *	

* Good
** Excellent

Plants (continued)

Name and Description of Film	Other Grade Placements	Remarks
24. Spruce Bog ** McGraw-Hill, 1960; 23 min., color Shows the ecological evolution that takes place in the formation of a spruce forest from the open water stage through spruce bog to the final stage when the bog has been replaced by a spruce forest. Deals with the bog in detail--pictures its plant life and shows its composition. Uses time-lapse photography to reveal the growth of various plants and traces their decay and extinction in natural adaptations which result from the damming of stream flow. Shows the replacement of land plants by water and the growth of water plants which provide a foundation for moss that chokes off the water and provides a support for shrubs. Explains how forests move in from the shore and furnish an environment to support the fauna of the region. Shows destruction of the forest by fire and the beginning of another evolutionary cycle.	Gr. 10 - **	
25. Taking Care of Our Garden ** EBF, 1952; 10 min., color Two children working with their father in the garden discover the positive and negative factors in plant growth. Includes scenes of weeding, thinning, detecting and fighting insects, watering, and hoeing.	Gr. 5 - *	
26. Trees: How We Identify Them ** Coronet, 1958; 11 min. Points out ways to identify trees-- by shape, bark, leaves and fruit--and explains the difference between deciduous trees and evergreens. Shows individual characteristics of many trees.	Gr. 5 - **	

* Good
** Excellent

Plants (continued)

Name and Description of Film	Other Grade Placements	Remarks
27. Wheat Rust ** EBF, 1960; 15 min., color Reveals the complex life history of a parasitic plant--its damaging effects on one of our most important food crops. Shows how man is working to combat this international menace.	Gr. 10 - **	
28. Wheat: The Staff of Life ** Simmel-Meservey, 1947; 33 min. Divided into three parts--Growing of wheat; Milling of wheat; Uses of wheat (available separately). 1st--world's wheat growing area, machines used, kinds of wheat, dangers to crop, annual consumption and storage. 2nd--testing samples, cleaning, tempering, and breaking of grains, separation of bran from starch and embryo, bleaching, packaging. 3rd--making macaroni, wheat products in diet, bread-making, making doughnuts, cakes.	Gr. 10 - *	
29. Why Foods Spoil (Molds, Yeasts, Bacteria) ** EBF, 1957; 14 min. Reviews pioneer efforts to preserve foods; describes work of molds, yeasts, and bacteria, explaining how they grow and multiply, how they spoil food, and how they can be destroyed by such methods as drying, smoking, canning, freezing, pasteurizing, dehydration, and by use of gamma rays.	Gr. 10 - **	

* Good
** Excellent

SCIENCE MOTION PICTURE FILMS - Grade Seven
(Addendum)

Additions to
Page 25

II. Living Things

Plants

Name and Description of Film	Other Grade Placements	Remarks
Plant Motions - Roots, Stems, Leaves ** EBF; 1962; 11 min., color Unusual time-lapse photography--in which plant growth is speeded up from one thousand to five thousand times--clearly illustrates the basic motions of growing plants. A series of classic experiments shows the response of the stems, leaves, tendrils, and roots of growing plants to light and gravity--and live film sequences show the viewer how to conduct and interpret similar experiments with the growth and motion of plants.	Gr. 5 - **	

* Good
** Excellent
5-9-67

Plants (continued)

Name and Description of Film	Other Grade Placements	Remarks
30. Working Water ** Pat Dowling, 1957; 14 min., color Shows how running water can be harnessed by dams and used for irrigation of arid areas. Explains the importance of an adequate water supply, sunshine, and good soil for the growing of healthy crops. The channeling of water to the farm land, and the ways in which it is controlled and distributed by irrigation are also shown.	Gr. 7 - Gr. 4 - ** Gr. 10 - **	Also listed Under Water

* Good
** Excellent

II. Living Things

Animals

Name and Description of Film	Other Grade Placements	Remarks
1. Adaptation of Insects Stanton, 1962; 13 min., color Four types of adaptation with insects are viewed, including structural, where body structure changes; mimicry, where insects can fit their surroundings through color for camouflage; numerical adaptation to show the reason for so many reproductions to produce a few survivors; and seasonal adaptations.	Gr. 7 -	No eval. yet
2. Adventures of a Chipmunk Family EBF, 1958; 11 min., color Shows how chipmunks live, what and how they eat, their enemies and how they deal with them. Views the inside of an actual chipmunk den and follows an exciting chase by the animal's most dangerous enemy. Concludes with the family's preparations for the winter: nest building, food storage, and the digging of escape passages.	Gr. 7 - Gr. 4 - ** Gr. 2 - **	No eval. yet
3. Amoeba ** United, 1949; 10 min., black & white Microphotography and animated drawings show the structure and life functions of a single-celled organism. Includes the production of pseudopodia, the pursuit and capturing of prey, the process of ingestion, and reproduction by fission.	Gr. 10 - **	

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
4. Amphibians: Frogs, Toads, and Salamanders** Film Assoc. of Calif., 1956; 11 min. Presents the four major groups of amphibia; frogs, toads, tree frogs, and salamanders. Differentiates between the tailed and tailless amphibia, illustrating their development from eggs and their ways of life.	Gr. 5 - ** Gr. 10 - *	
5. Animal Habitats ** Film Assoc. of Calif., 1956; 11 min. Presents different kinds of habitats in which animals live and covers the adaptations that animals make to their habitats. Environments explored include the aquatic, the deciduous woods, the prairie, the desert, and coniferous forests at both low levels and in the arctic alpine zones. Some of the modifications and habits of the animals typifying these environments are given as well as the reasons for these variations.	Gr. 4 - ** Gr. 10 - *	
6. Animal Life at Low Tide ** Pat Dowling, 1955; 11 min., color A boy and a girl visit the seashore and at a tidepool, find and study many salt water animals and their means of locomotion, protection and getting food. Included are starfish, tube building sea worms, sea anemone, limpet, sea urchin, snails and the molting of hermit crabs.	Gr. 4 - ** Gr. 8 -	 No eval. yet

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
7. Animals in Autumn * EBF, 1957; 11 min. Shows typical autumn activities of various animals, including deer, foxes, rabbits, ground squirrels, raccoons, weasels, conies, cold-blooded animals, birds, and insects, as they search for food, build homes, and prepare to migrate or hibernate during the winter months.	Gr. 2 - ** Gr. 4 - **	
8. Animals in Summer ** EBF, 1955; 11 min. Shows more than a dozen common animals of the woods, varying from fish to insects and nest-eaters. The animals are seen seeking food and sheltering their young from enemies.	Gr. 1 - ** Gr. 4 - ** Gr. 5 - **	
9. Animals of the Indian Jungle ** EBF, 1957; 11 min., color Explores the dense tropical rain forest of eastern India, showing close-up views of representative animals in their native environment--the crocodile, tiger, python, cobra, mongoose, monkey, and elephant. Describes and illustrates the pattern of survival in the jungle, pointing out the ways of the hunters and the defenses of the hunted.	Gr. 4 - **	

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
10. Animals See in Many Ways ** Film Assoc. of Calif., 1962; 12 min., color Illustrates the likenesses and differences in the eyes of various animals. Uses animated drawings to show parts and functions of simple, compound, and camera-like eyes. Points out how the position of the eyes on the head tells about the animal's way of life. Describes the eyes of snails, spider's, grasshoppers, flies, horses, owls, alligators, cats, squirrels, and frogs.		
11. Animals Unlimited ** Assoc. Films, 1956; 11 min. A field trip across Africa brings to this picture painstaking photography of Africa's native animals in their native environments. While the vehicles traveled the work roads, numerous side trips into the bush and forests enabled the photographers to find the animals in their natural haunts. Much of the game is shown both pursuing and being pursued by their natural enemies.	Gr. 5 - ** Gr. 10 - *	
12. Animals Useful to Man ** EBF, 1960; 11 min., color Traces the contributions that animals have made to man's welfare from primitive times to the present day. Explains that animals are valuable as a source of food and raw materials for many products, that in many regions of the world the muscle-power of animals is almost indispensable, that doctors and scientists find ever-increasing uses for animals in research, and that animal pets are good companions.	Gr. 4 - **	

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
13. Animals--Ways They Eat ** EBF, 1956; 11 min. Shows in detail how the body parts of various animals are related to their eating habits. Includes such examples as the cirri of barnacles, the mouth parts and legs of crayfish, the teeth of lions and cows, the tongues of butterflies, the noses of hogs, the beaks of birds, and the paws of squirrels.	Gr. 5 - **	
14. Animals--Ways They Move ** EBF, 1956; 11 min. Close-up, slow-motion, and fast-motion photography is used in showing how animals move in water, on land, and in the air. Explains that an animal's movement helps it to acquire food, to protect itself from enemies, to find a home, to move from place to place, and to adapt to its environment.	K - ** Gr. 4 - **	
15. Ants * EBF, 1948; 11 min., black & white Depicts, by means of close-up photography, varied activities of four different types of ants--mound builders, black ants, household ants, and carpenter ants. Shows in detail the life cycle of the carpenter ant, including construction of the nest, laying of eggs, feeding of young, hatching, and preparations for swarming. Portrays an intercolony battle between mound builder and wood ants.	Gr. 5 - **	

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
16. Beach and Sea Animals ** EBF, 1931; 10 min., black & white Examines the characteristics, habits and importance of familiar invertebrate animals dwelling on or near the beach. By underwater close-up photography in their respective environments, reveals the starfish, sea urchin, crab, cuttlefish, octopus, lobster, crayfish, prawn, shrimp, snail, scallop, mussel, and sea cucumber. Illustrates interrelationships, methods of self-protection, and balance in nature.	Gr. 4 - **	
17. Bear Country ** Walt Disney, 1958; 33 min., color No animal has excited more human curiosity, laughter and respect than the North American black bear. Disney cameras present a remarkable photographic coverage of this giant of the Rocky Mountain region.	Gr. 4 - ** Gr. 5 - **	
18. The Beaver ** EBF, 1950; 10 min., color Shows activities of the beaver in its natural environment. Illustrates ways in which the beaver's teeth, feet, and tail help him in swimming, eating, felling trees, and repairing a broken dam. Reveals the unique construction of a beaver house, and stresses the importance of the animal as an agent of conservation and as a valuable fur bearer.	Gr. 2 - ** Gr. 4 - **	

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
19. Beaver Valley ** Walt Disney, 1953; 32 min., color Pictures the life of a beaver through the cycle of the seasons, showing how he meets his daily needs, builds his house, and conducts his courtship. Filmed around a beaver pond in the West. The other animal, bird, and fish life of the area are also portrayed.	Gr. 4 - ** Gr. 5 - **	
20. Beginnings of Vertebrate Life ** EBF, 1964; 11 min., color The film documents the recent work of Dr. Tokio Yamamoto, whose new method for artificially fertilizing the egg of Oryzias latipes, a small fish, has made the whole process of embryonic development clearly observable under the microscope. The use of animation illustrates in careful detail the early developmental processes of fertilization, cell division, and blastula formation. Thought questions are posed at important points throughout the film to encourage students to interpret and apply key concepts.	Gr. 7 - Gr. 10 -	Diff. Vocabulary No eval. yet
21. The Big Green Caterpillar * Stanton Films, 1961; 11 min., color On an ordinary street there is a tree. On the tree there is a tiny insect egg. A boy finds the egg and raises the caterpillar that hatches out of the egg into an adult insect. The boy wonders how his pet grew so big in such a short time, eating only tree leaves. He wonders if chemicals in its body changed tree leaves into good food.	Gr. 1 - ** Gr. 2 - ** Gr. 5 - ** Gr. 7 -	Elementary

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
22. Biography of a Fish ** Sterling Films, 1950; 9 min., black & white The male stickleback builds his nest; courts the female; supervises egg laying; defends embryos from snails, salamanders, and other enemies; keeps newly hatched fish in the nest until they have matured enough to shift for themselves; and is finally eaten by a pike.	Gr. 10 - **	
23. Bird in Your Backyard ** Arthur Barr Prod., 1950; 11 min., color Two brothers share the fun and responsibility of a project to attract birds to their backyard. They make a feeding tray and observe the birds that come to feed; clean and refill a bird bath and learn the drinking and bathing habits of the bird visitors; discover a towhee nest, watch the eggs hatch, observe the parent birds care for their babies, and later see the young birds leave the nest.	Gr. 2 - ** Gr. 3 - **	
24. Birds Are Interesting ** EBF, 1950; 10 min. Presents some basic biological concepts concerning birds. Provides a systematic analysis of birds by classifying them under three categories--swimming and wading birds, birds of prey, and perching birds. Contrasts such features as bills, feet, and wings to characterize each type. Birds depicted include hawks, owls, ducks, pelicans, canaries, and domestic chickens.	Gr. 4 - ** Gr. 5 - **	

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
25. Birds in Winter * Coronet, 1946; 11 min. Presents the seasonal aspect of bird life, the interdependence of living things, and the food-getting adaptations of birds in winter. Shows how to use a feeding station to attract such winter birds as the chickadee, nuthatch, woodpecker, junco, cardinal, English sparrow, starling, and robin, and how to recognize each.	Gr. 1 - ** Gr. 4 - **	
26. Birds of North America, No. 3 ** EBF, 1949; 11 min., color A study of three North American birds: the killdeer plover, the nighthawk, and the cedar waxwing. Reveals distinctive markings and cries of these birds and illustrates how each bird behaves when its nest is threatened. Animated maps point out summer and winter habitats, and close-ups show feeding habits of young birds.		
27. Birds of North America, No. 4 ** EBF, 1949; 11 min., color Depicts the identifying characteristics of three North American birds: the spotted sandpiper, the sora rail, and Barrow's goldeneye. Indicates their summer and winter ranges, and portrays, by means of close-up photography, the mother birds on their eggs, the eggs hatching, and the young birds venturing out into their world of rock, reed, and water.	Gr. 5 - *	

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
28. Birds of the Countryside ** Coronet, 1946; 11 min., color A study of six birds, including the indigo bunting, the meadowlark, the nighthawk, the kingbird, and the killdeer. Analyzes their adaptation to environment, their struggle for existence, and their economic importance. Illustrates some of the ways by which they protect themselves.	Gr. 4 - **	
29. Birds of the Dooryard ** Coronet, 1954; 11 min. Presents birds which build their nests in gardens and near homes--robins, yellow warblers, eastern phoebes, yellow-shafted flickers, cardinals, swallows, house wrens, and purple martins. Describes the differences among these birds, their ways of protecting their nests and feeding their young, and ways in which they can be encouraged to nest around houses.	K - ** Gr. 2 - ** Gr. 3 - ** Gr. 5 - **	Adv. vocab.
30. Birds of the Inland Waterways ** Coronet, 1946; 11 min., color Presents various birds of inland waterways in their native habitats. Shows the belted kingfisher, the glossy ibis, avocet, red-backed sandpiper, Canada goose, lesser scaup duck, and several members of the heron family.	Gr. 3 - **	

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
31. Birds of the Seashore * EBF, 1951; 11 min., color Portrays the activities, habitats, and distinguishing marks of various North American water birds. Depicts gulls in flight and nesting in colonies; gannet colonies on Bonaventure Island; eider ducks in the St. Lawrence estuary; and the black guillemot, blue heron, razor-billed auk, and cormorant. Includes bird calls.	K - ** Gr. 3 - ** Gr. 5 - *	
32. Birds of the Woodlands * Coronet, 1950; 10 min., black & white Shows the life and habits of five native woodland birds: the redstart, purple finch, ovenbird, northern flicker, and the black-billed cuckoo.	Gr. 4 - * Gr. 10 - **	
33. The Bobolink and Blue Jay ** Coronet, 1946; 11 min., color Shows the family life of the blue jay, who lavishes attention on his helpless young, and the bobolink, who also is on the job when the youngsters get hungry.	Gr. 2 - ** Gr. 5 - **	Mature
34. Butterfly Botanists ** Coronet, 1947; 11 min., color Presents the life cycles of the monarch, fritillary, viceroy, wanderer, and other butterflies; includes references to the plants on which they live.	Gr. 4 - ** Gr. 10 - **	

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
35. Camouflage in Nature ** Coronet, 1963; 22 min., color Reveals how camouflage protects animals, birds, and fish from their natural enemies. Shows contrast between those animals who are boldly marked and those who carry inconspicuous markings because they need protection for reasons of sex, age or lack of ability to defend themselves. Illustrates color matching and pattern matching as camouflage techniques.	Gr. 4 - *	
36. Cecropia Moth ** Murl Deusing, 1960; 11 min., color Here is the life story of one of our most familiar insects. The story begins in late winter with the moth still in cocoon. Shows the moth emerging from the cocoon in time-lapse photography. The film shows the complete life cycle and the various changes that take place from the time the eggs are laid until the pupa is snug in a cocoon for the winter.	Gr. 5 - **	
37. Common Animals of the Woods * EBF, 1943; 11 min., black & white Presents a study of various common animals in their natural habitat. Gives information as to appearance, size, adaptiveness, habitat, habits, and care of the young for such animals as the squirrel, rabbit, raccoon, porcupine, otter, mink, beaver, opossum, skunk, and woodchuck.	K - ** Gr. 2 - **	

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
38. Crustaceans: Lobsters, Barnacles, Shrimp, and Their Relatives ** EBF, 1955; 13 min. Describes characteristics common to crustaceans and explains how they are related to other arthropods of the past and present. Studies the structure and life processes of representative types of crustaceans, including the fairy shrimp, the cypris, the cyclops, the barnacle, and the crayfish. Discusses the economic importance of crustaceans.	Gr. 10 - **	
39. Development of the Chick * United, 1948; 10 min., black & white Examines the structure of the egg, and shows the early stages of embryonic development through the third day. Depicts the formation of allantoise, limb buds, and the rapid growth and development of the embryo. Observes the hatching process, and growth of the chick through various stages to maturity.	Gr. 10 - *	
40. Earthworms ** Pat Dowling, 1957; 11 min., color Shows how the earthworm, after emergence from the cocoon, eats its way through earth, digests food, and brings castings to the surface. Explains how the earthworm forms tunnels that help to aerate and enrich the soil and carry water to plant roots.	Gr. 3 - ** Gr. 4 - ** Gr. 5 - **	

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
41. Fish, Moon and Tides ** Academy, 1963; 15 min., color Traces the spawning activities of the Grunion, the only fish that spawns on the land. Shows how the Grunion uses the tides in its spawning activities, coming out of the ocean only on two or three nights after full or new moon, burrowing in the beach sand to lay eggs and then being washed back into the ocean at high tide. Uses photographs of microscope slides to show the development of the fish egg during the nine days from fertilization of the egg to the hatching of the baby fish.		
42. Five Colorful Birds * Coronet, 1944; 11 min., color Presents five of America's most colorful birds--the goldfinch, cedar waxwing, yellow-headed blackbird, redheaded woodpecker, and bluebird--in their natural habitat, feeding, nesting, and rearing their young.	Gr. 2 - ** Gr. 4 - *	
43. Fossils: Clues to Prehistoric Times ** Coronet, 1960; 10 min., color The story of fossils (the traces of ancient animals or plants) where they are found, how they were formed and what they tell us about the development of life on earth is the subject of this study. Museum dioramas, animation, and many fossil specimens are used to explain the work of scientists and their findings.	Gr. 4 - ** Gr. 8 - **	

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
44. Frog ** EBF, 1931; 10 min., black & white Traces the development of the frog and examines its physical traits and characteristics. Through close-up and time-lapse photography portrays the development of the tadpole embryo and the hatching of eggs. Depicts the growth of the tadpole and discloses the physical characteristics and natural traits of the adult frog.	Gr. 5 - * Gr. 10 - **	
45. From One Cell ** Am. Cancer, 1950; 14½ min., color Embryonic, regenerative and degenerative cell behavior. Beginning with the fertilized egg-cell and proceeding through the various life stages from infancy to old age, diagrammatic and live-action sequences review the phenomena of generative growth. The film then moves on to regenerative growth in the repair and replacement of body tissue. Finally, the abnormal growth of cancer is presented.	Gr. 10 - **	
46. The Grasshopper: A Typical Insect ** Coronet, 1955; 6 min. Presents various characteristics and habits of the grasshopper. Explains that it is an insect because its body is divided into three parts and it has three pairs of legs. Pictures its strong hind legs, spiracles, and its compound eyes. Describes its life cycle stages as an example of incomplete metamorphosis. Mentions destructiveness of the insect.	Gr. 5 - **	

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
47. Grouse of the Grasslands ** EBF, 1950; 10 min., color Shows the mating ceremonies of the prairie chicken. Portrays the booming of the male, his strutting to attract the female and his mating-time coloration. Filmed in western Missouri.	Gr. 10 - **	
48. The Honey Bee - A Social Insect ** C O R, 1955; 6 min., color Describes the life cycle of the honey bee. Indicates the three types of bees. Explains the duties of each group. Shows the process of "swarming" as a queen bee leaves the hive after laying eggs and a new queen emerges to take over the hive. Explains the meaning of the term "social insects". Describes the characteristics of such insects.	Gr. 5 - **	
49. The Honeymakers ** U of M, 1952; 20 min., color Studies details of the honeybee's life cycle, from the laying of the eggs by the queen until the adult worker, drone, or queen emerges. Depicts the activities of the hives from the gathering of nectar to swarming.	Gr. 5 - ** Gr. 10 - **	

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
50. House-fly ** EBF, 1936; 11 min., color Describes the house-fly as a menace to health through a portrayal of its habits and life history. Traces physical development from egg laying through larval and pupal stages to the emergence of the young fly. Through magnified views, reveals biological structure and methods of carrying and spreading disease germs. Suggests control methods.	Gr. 5 - * Gr. 10 - **	
51. The Housefly and Its Control ** Coronet, 1962; 11 min., color Views of a large-scale model and close-up photography of the egg laying, hatching, and emergence of the adult from the pupa are used in portraying the anatomy, life-cycle and feeding habits of the common housefly. Shows how the housefly contaminates food and spreads diseases, and recommends methods for combating it.	Gr. 5 - ** Gr. 10 - **	
52. How Nature Protects Animals ** EBF, 1931; 11 min., black & white Examines the phenomena of protective adaptation of various animals to different environments. Portrays representative types in their natural habitats and illustrates different kinds of protection including ability to run rapidly, mimicry, coloration, armor, and secluded homes. Among the animals shown are the tiger, giraffe, zebra, horse, kangaroo, rabbit, chameleon, magpie, woodpecker, saterhen, pheasant, looper caterpillar and beehawk moth.	Gr. 10 - **	

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
53. Hydra ** United World, 1949; 10 min., black & white Presents the hydra in its native habitat. Close-ups reveal details of mouth structure and ingestion of food, as well as locomotion. Diagrams show body wall layers and cells. The hydra's ability to replace cells and regenerate body parts is observed, and sexual and asexual reproduction is shown.	Gr. 10 - **	
54. Insect Collecting ** Pat Dowling, 1960; 14 min., color Points out that collecting specimens is an important part of any study of insect life. Shows common and some uncommon terrestrial and aquatic insects in close detail and tells where to look and how to capture specimens. Describes methods of collecting which include netting, beating of host plants, night collecting, investigating dead parts of trees, using the Berlese funnel to procure microscopic specimens, and aquatic methods. Explains where to look for larvae, pupae and eggs, and how to raise them to adult stages.	Gr. 10 - ** Gr. 5 - **	
55. Insect Foods ** Pat Dowling, 1960; 14 min., color What insects eat and their feeding habits are of great importance to people. Every plant and animal provides food for some kind of insect. In very close action examples of larval, pupal, adult, or all stages of life are presented as they apply to feeding. Included are katydid, grain beetle, polyphemus moth, termite, flea, preying mantis, antlion and others.	Gr. 4 - ** Gr. 5 - ** Gr. 10 - **	

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
56. Insect Life Cycle: The Periodical Cicada ** EBF, 1956; 11 min., black & white Follows the visible phases of the life cycle of the periodical cicada, showing its emergence, transformation, and hatching. Includes animated diagrams.	Gr. 10 - **	
57. Insects EBF, 1953; 10 min., color Enumerates characteristics of insects. Shows reproductive and growth processes, structural characteristics, and eating habits typical of each of the five classes within the insect world. Describes the constructive and destructive habits of a variety of insects and the natural and man-made controls which prevent unlimited insect multiplication.	Gr. 7 - Gr. 4 - ** Gr. 10 - **	No eval. yet
58. Insects are Interesting ** Int'l Film Bureau, 1953; 11 min., color Presents a clear understanding of how insects live, their life histories and their adaptations. Illustrates in detail, the metamorphosis of the locust, moth and butterfly. Stresses the importance of insects to man.		

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
59. Introducing Insects: Butterflies, Beetles, Bugs **	Gr. 5 - ** Gr. 10 - **	
EBF, 1961; 17 min., color		
Within the animal kingdom is the fascinating world of insects. This film explains how insects are classified in the animal kingdom--how they differ from other animals and how the main order of insects differ from each other. Magnified close-ups, slow-motion and time lapse photography reveal the structure and characteristics of insects and show different stages in their life cycles.		
60. The Ladybird Story *	Gr. 4 - * Gr. 10 - *	
Pat Dowling, 1957; 10 min., color		
An explanation of how the Cottony Cushion Scale, an insect that attacks such trees as apple, peach, walnut, orange, lemon, and grapefruit was brought under control in the United States by the importation of its natural enemy, the Ladybird Beetle. Plant experts discovered the scale in 1872 but were unable to control it with any then known sprays. Study of the scale in its native Australia revealed how the Ladybird Beetle was its natural enemy. Importation and control followed.		
61. Life Cycle of a Fly **	Gr. 10 - **	
United World, 1948; 10 min., black & white		
Life cycle of the blue bottle fly. Close-ups and time-lapse photography present egg laying, hatching, feeding and growth of larvae, emergence from pupal case, burrowing to the earth's surface, reaction to light, and expansion of the wings.		

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
62. Life Science: Response in a Simple Animal ** Film Assoc. of Calif., 1962; 11 min., color Scientists tell us that all the activities of living things are responses to change. These changes occur in an organism's surroundings, or in its own body. Unique microphotography illustrates excitingly how a simple animal, the amoeba, responds to different kinds of changes. Such activities as movement, food getting, and reproduction are simply responses to internal and/or external change.		
63. Life Story of the Hummingbird ** EBF, 1964; 16 min., color An unusual combination of slow-motion and high-speed photography, with many extreme closeups, makes it possible to observe aspects of the hummingbird's behavior which have never been so clearly recorded on film before: the wingbeats (more than 60 in a second), the spectacular high dives and gymnastics of the male during courtship; the nest-building artistry of the female; the hatching of the chicks; and the mother's techniques for feeding her young and encouraging them to fly.	Gr. 4 - Gr. 5 -	No eval. yet No eval. yet
64. Life Story of the Paramecium ** EBF, 1964; 11 min., color Remarkable microphotography provides a unique live-action study of the paramecium in its natural environment, showing life functions such as locomotion, feeding, digestion, excretion, and reproduction.	Gr. 4 -	No eval. yet

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
65. Life Story of the Sea Star ** EBF, 1964; 11 min., color The film offers unusual close-ups of the sea star's physical development and activities--the action of its tube feet, the delicate maneuvers by which it rights itself when it is turned over, the way it captures and digests its prey, and the highlights of embryonic development from the earliest larval stage to adulthood. The film also includes live photography of the rare sea lily and the basket star.	Gr. 4 - Gr. 5 -	No eval. yet No eval. yet
66. Life Story of the Snail ** EBF, 1964; 10 min., color A typical fresh-water snail is photographed in an aquarium which simulates the animal's natural habitat. Close-up shots reveal details of physical structure and characteristic modes of behavior, such as feeding and locomotion. A model of a snail is used to indicate the location of the various body organs and structures. Thought questions are posed at several points during the narration to encourage students to apply and interpret important concepts presented in the film.	Gr. 4 - Gr. 5 -	No eval. yet No eval. yet
67. Life Story of the Toad ** EBF, 1964; 10 min., color Examines the physical characteristics and life cycle of the toad, a typical amphibian. Shows how it is adapted to living in water as well as on land. Describes the locomotion, feeding habits, courtship, reproduction, and special means of protection against enemies.	Gr. 4 - Gr. 5 -	No eval. yet No eval. yet

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
68. Living Bird ** Murl Deusing, 1960; 13 min., color Shows a variety of characteristics and behavior of birds. Presents their powers of flight and uses animation to compare birds' metabolism with that of man. Examines their senses of sight, smell, hearing and their adaptations of bills to the types of food they eat. Illustrates courtship of birds by picturing the drumming of ruffed grouse, and the dance of prairie chickens. Pictures nest building, incubation, and the role of the egg tooth in hatching. Concludes by presenting the parasitic nesting habits of cowbird.	Gr. 5 - ** Gr. 10 - **	
69. Mammals Are Interesting ** EBF, 1953; 12 min., color Discusses the characteristics of protozoa, sea anemones, fish, reptiles, birds and insects, and explains how they differ from mammals. Shows how hoofed mammals, carnivores, rodents, and primates are basically alike and describes the characteristics which are peculiar to each group.	Gr. 5 - ** Gr. 10 - *	
70. Marine Life ** EBF, 1953; 11 min., color Underwater photography is used in showing how big fish hunt for victims while the small fish seek safety. Includes scenes of a porpoise, a sea turtle, an angel fish, a Spanish hogfish, a sawfish, an octopus, a green moray, a baracuda, and different species of crabs and sharks. Photographed at the Marine Studios at Marineland, Florida.	Gr. 5 - ** Gr. 8 - Gr. 10 - **	 No eval. yet

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
71. Marsh Waters: Waste or Wealth? ** U of M, 1953; 15 min., color Presents the viewpoint of persons who see positive values in marshlands; suggests that present surface water programs be examined before too many ponds and marshes disappear; and points out the results of shortsightedness in using other natural resources. Also shows the surface water problem through the eyes of people acquainted with various phases of the problem--flood relief workers, geologists, fire wardens, trappers, waterfowl hunters, landowners, and nature hobbyists.	Gr. 10 - **	
72. Metamorphosis--Life Story of the Wasp ** EBF, 1963; 14 min., color Outstanding use of microphotography reveals the intricate processes of growth and development of a wasp through early stages of metamorphosis. By means of a tube especially constructed for observation, the camera reveals seldom-seen--and rarely photographed--features of growth and development that normally take place within a cocoon.	Gr. 10 -	No eval. yet
73. Migration of Birds ** EBF, 1960; 11 min., color Shows the yearly cycle in the life of a migrating bird. Discusses known facts and theories about the migration of the Canada goose--when, how, where, and why the birds migrate.	Gr. 2 - ** Gr. 4 - **	

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
74. Minnesota Brown Trout ** U of M, 1952; 20 min., color Presents the research and propagation programs being carried on by the Minnesota Dept. of Conservation to maintain adequate numbers of brown trout in the streams of southern Minnesota.	Gr. 10 - **	
75. Mollusks ** EBF, 1955; 14 min. Shows the forms, functions, and habitat of the several classes of mollusks, and explains that some mollusks have economic value as food and as sources of pearls and shell.	Gr. 10 - **	
76. Monarch Butterfly Story ** EBF, 1951; 11 min., black & white Portrays in detail the life cycle, minute features, and unique activities of the monarch butterfly in its four stages of development. Close-up photography depicts the monarch laying its eggs, and the caterpillar eating its way out of the egg, feeding, molting, forming its chrysalis, and emerging as a butterfly.	Gr. 5 - **	
77. The Mosquito and Its Control ** Coronet, 1962; 11 min., color Relates the life cycle of the mosquito to the larger problems of health and the control of the mosquito-transmitted diseases. Details of the anatomy of the mosquito are clearly shown in oversize glass models of the three major species of mosquitos. Good clear, live-action scenes of egg-laying, molting, adult emergence, and sucking of blood are shown.	Gr. 10 - **	

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
78. The Nervous System ** EBF, 1937; 11 min., black & white Examines the structure and functions of the spinal cord, medulla, mid-brain, thalamus, and cerebrum. Explains, through animated drawings, how sense organs recsive stimuli, and how nerves carry impulses to the central nervous system and then to the muscles which execute responses. Compares the nervous system structures and responses in various animals.	Gr. 10 - *	
79. The Olympic Elk ** Walt Disney, 1951; 27 min., color A photographic study of the Olympic elk which abound on the Olympic Peninsula in the State of Washington. Describes the life of the herd in the winter quarters in the low country called thr rain forest, the trek to the summer feeding ground in the high country, and the placid summer existence of the herd, which culminates in the September mating season. Shows the attempts of the bulls to assemble harems and the resulting battles between the males.	Gr. 2 - ** Gr. 4 - **	
80. Protozoa; One-Celled Animals ** EBF, 1957; 11 min. Dr. Roman Vishniac, scientist and photomicrographer, identifies pseudopods, flagelettes, and ciliates, showing how they move, eat, and reproduce. Provides examples of symbiosis, parasitism, and colonial organization.	Gr. 10 - **	

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
81. Prowlers of the Everglades ** Walt Disney, 1961; 32 min., color Presents the life of the alligator, otters, and birds in the swamps of the Florida Everglades.	Gr. 4 - ** Gr. 10 - **	
82. Putting Animals in Groups ** Int'l Film Bureau, 1959; 13 min., color Introduces children to the idea that they can classify animals by observing animal structure. Explains distinctive characteristics of mammals, birds, reptiles, amphibians, fishes, and insects. Scientific vocabulary kept to a minimum. Common animals used. Simple classifications. Frequent questions.	Gr. 5 - **	
83. Reptiles ** EBF, 1955; 15 min., color This film shows some of the most fascinating animals of the world. As an introduction, it brings to our attention the reptiles of prehistoric days. The film continues in discussing the five kinds of reptiles that inhabit the earth today. It points out many interesting facts about each of these kinds.	Gr. 5 - ** Gr. 10 - **	
84. Reptiles and Their Characteristics ** Coronet, 1959; 11 min., Identifies the five orders of animals that make up the reptile group and points out their common characteristics and some of their differences. Pictures snakes, lizards, turtles, crocodilians, and the rare tuatara in their native habitats; explains how they live and reproduce, their adaptations to their environments, and some of the ways in which they benefit mankind.	Gr. 4 - ** Gr. 5 - **	

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
85. The Salmon Story * EBF, 1950; 11 min., color Portrays the basic stages in the life cycle of the salmon, and calls attention to the steps taken by modern fish hatcheries to insure a continuing supply of this food fish. The purse seine method of catching salmon is featured as one commonly in use today. Follows the catch from the sea to the cannery, depicts canning operations including cleaning, scaling, removing of heads, canning, cooking, and final preparation for shipment.	Gr. 5 - **	
86. Seashore Life ** EBF, 1950; 11 min., color Shows how representative animals found on the sandy beach, the rocky beach, and the mud flat are adapted to their environments. Explains how they feed, move, and compete with other kinds of animal life.	Gr. 4 - **	
87. Secrets of the Bee World ** Walt Disney, 1960; 13 min., color Shows the many facets of life in a highly organized bee colony. Describes the construction of the comb. Discusses the importance of the queen and explains about the work of the bees in the pollination process.	Gr. 7 - Gr. 10 - **	Excellent

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
88. Snakes * Coronet, 1947; 11 min. A description of the kinds of snakes found in the United States, with emphasis on the appearance and habits of the four poisonous types; the rattlesnake, the copperhead, the cottonmouth moccasin, and the coral snake.	Gr. 5 - **	
89. Snakes are Interesting ** Murl Deusing, 1960; 11 min., color Presents facts about snakes to allay common fears and superstitions. Explains about their body temperatures, their method of locomotion, their sense organs, the shedding of their skin, and some characteristics of the rattlesnake. Shows snakes being born and hatched.	Gr. 10 - **	
90. Snapping Turtle * EBF, 1940; 11 min., black & white Presents the life cycle of the snapping turtle--birth, growth, and the struggle for existence and survival. Shows its activities, its encounters with other animal life, how it gets its food and lays its eggs, how its young hatch and develop, and how it hibernates.	Gr. 5 - ** Gr. 10 - *	Easy Film

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
91. Spiders ** F[illegible]. 1931; 11 min., color Trac[illegible]he life cycle of the nursery-web spider, and illustrates characteristics of the orb-web, funnel-web, and trap-door species. Close-up photography reveals the female as she lays her eggs and encloses them in a silken cocoon to await hatching. Other sequences depict the hatching of eggs, development of the young, web-spinning, and ensnaring of insects for food.	Gr. 5 - *	
92. The Story of the Bees ** United World, 1949; 20 min., black & white Micro-photography is used in showing the life cycle of the honey bee and details of the community life within the hive. Includes sequences showing the role of the queen in the hive.	Gr. 5 - ** Gr. 10 - **	
93. Tide Pool Life ** Instructional Films, 1947; 11 min. Studies some of the more usual species of marine life found near rocky shores and tide pools, including mussels, whelks, sea-anemones, sea-urchins, and abalones.	Gr. 5 - ** Gr. 10 - **	
94. Toads ** Pat Dowling, 1957; 10 min., color A description of the life and habits of the toad, an animal that lives partly in the water and partly on land, and is one of the oldest known amphibians. Hatched in shallow water, the animal develops lungs and legs before he can be a land animal. It eats all types of insects, catching them by its long sticky tongue. Toads are the natural prey of snakes.	Gr. 4 - ** Gr. 5 - **	

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
95. Vanishing Prairie, Part I Pioneers, Indians and the Buffalo Walt Disney, 1962; 26 min., color Describes the area that was once the American prairie, lying between the Mississippi River and the Rocky Mountains. Depicts how the pioneers traversed this trackless area in prairie schooners using trails and natural landmarks to guide them. Shows how the Indian lived in harmony with the wild life of the region until the white man came. Presents the buffalo as the symbol of the vanishing prairie. Shows the birth of a buffalo calf and follows the herd in its search for grass and water. Depicts life within the buffalo herd--a battle between bulls, a storm-caused stampede, fire and flood.	Gr. 4 - Gr. 7 -	No eval. yet No eval. yet
96. Vanishing Prairie, Part II Animals of the Prairie Walt Disney, 1962; 27 min., color Describes the habitat and ecology of many small animals native to the prairie. Depicts the prairie dog and his adaptations to underground life in colonies. Shows the activities of hunting animals like the ferret and the rattlesnake; and the defensive precautions of prairie dog and pocket gopher. Presents several species of large animals that once roamed the plain but are now found in the foothills of the Rocky Mountains--the prong-horn antelope, the big horn sheep, the mountain lion and deer. Shows how these animals have adapted to a new environment.	Gr. 4 - Gr. 7 -	No eval. yet No eval. yet

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
97. Vegetable Insects ** Int'l Film Bureau, 1946; 20 min., color A study of several vegetable insects; analyzes their different methods of destruction, and explains the need for special measures for their control. Shows potato beetles, caterpillars, aphids, cutworms, squash bugs, corn ear worms, and root maggots. Includes close-up photography.	Gr. 10 - **	
98. Water Birds ** Walt Disney, 1957; 32 min., color A picture of rare beauty, alive with excitement and rare glimpses into the behavior of seaside and marshland feathered creatures--climaxed by a striking musical bird ballet of the air.	Gr. 4 - ** Gr. 5 - ** Gr. 10 - **	
99. Waterfowl in Action ** U of M, 1950; 10 min., color Shows migrating water fowl as they stop to feed and rest in the marshes near Wheaton, Minn. Pictures the Franklin gull, gadwall, spoon bill, green- and blue-winged teal, diving ducks, blue and lesser snow geese, whistling swans, and others on the water and in flight. Explains feeding habits and identifying field marks.	Gr. 5 - * Gr. 10 - *	

* Good
** Excellent

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
100. White Wilderness - Part I The Arctic Region & Its Polar Bears Walt Disney, 1958; 28 min., color Presents the arctic region and the animals that live there. Describes the glaciers that lie in the valleys of this wilderness. Shows that walrus inhabit the area during the summer months. Depicts that the king of the arctic is the polar bear. Shows how the polar bears live; the babies are born during hibernation. Relates that the polar bear is the mortal enemy of the walrus tribe.	Gr. 4 - Gr. 7 -	No eval. yet No eval. yet
101. White Wilderness - Part II The Lemmings & Arctic Bird Life Walt Disney, 1958; 21 min., color Presents the arctic region and the animals and birds that live there. Shows the lemming, a small rodent. Relates how they appear, looking for food, before the snow leaves. Describes their mass migration to the sea. Shows some of the interesting waterfowl of the region--eider ducks, turnstones, phalaropes, arctic gulls, loons, golden eye duck. Explains how polar bears and ermine look for food in the waterfowl sanctuaries.	Gr. 4 - Gr. 7 -	No eval. yet No eval. yet
102. White Wilderness - Part III Large Animals of the Arctic Walt Disney, 1958; 21 min., color Presents the large animals that inhabit the arctic tundra. Describes the musk ox. Relates that the musk ox are herd animals by habit and react to danger by rushing to a central place, grouping themselves in a circle with the bulls along the outer edge. Shows the wolves, the caribou, the reindeer, the wolverine. Depicts the cunning and ferociousness of the wolverine.	Gr. 4 - Gr. 7 -	No eval. yet No eval. yet

* Good
** Excellent

SCIENCE MOTION PICTURE FILMS- Grade Seven
(Addendum)

Additions to
Page 59

II. Living Things

Animals

Name and Description of Film	Other Grade Placements	Remarks
Earthworm: Anatomy and Dissection ** Coronet; 1961; 11 min., color Stressing correct laboratory techniques for dissection, this film gives the student a close look at the digestive, circulatory, excretory, nervous and reproductive systems of the earthworm.	Gr. 10 - **	
Living Mammal ** IFB; 18 min., color Defining a mammal in biological terms, this film shows the characteristics held in common by all mammals and presents the various ways in which mammals have adapted themselves to life in the air, in the water, in tree tops and on the ground. Sequences examine the highly developed senses of sight, smell, touch and hearing and show how these are combined in the hunt for food. The adaptations of teeth for heribiverous, carnivorous and omnivorous modes of life are shown and diverse means of self protection are portrayed.	Gr. 10 - **	Excellent

* Good
** Excellent
5-9-67

Animals (continued)

Name and Description of Film	Other Grade Placements	Remarks
103. Wood Duck Ways ** U of M, 1956; 20 min., color Follows the wood duck from the courting and mating season in the early spring, through the incubation and hatching periods and the brood's emergence from its tree home. Shows three broods actually leaving their nests and landing on the ground. Depicts the brood as it feeds and grows to maturity, and makes suggestions on how to construct and place nesting houses.	Gr. 2 - * Gr. 5 - **	Diff. vocab.
104. Worms ** EBF, 1956; 13 min., color This film provides a remarkable study of the classes of Annelid worms--leeches, earthworms and seaworms--their structure, behavior and habitats.	Gr. 10 - **	

* Good
** Excellent

II. Living Things

Human Body

Name and Description of Film	Other Grade Placements	Remarks
1. About the Human Body ** Churchill-Wexler, 1960; 15 min. A young boy who goes to a doctor's office for a physical examination is told about the more important body systems. Explains, using animation, the function and uses of bones, ligaments and muscles, and demonstrates the working of the nervous, respiratory, digestive, and circulatory systems.		
2. Antibiotics * EBF, 1952; 14 min., black & white A study of the discovery, nature and uses of antibiotics, chemical substances which are produced by microbes and used to inhibit the growth of harmful bacteria in living organisms.	Gr. 7 - Gr. 10 - **	A little diff.
3. Balance Your Diet for Health and Appearance ** Coronet, 1960; 11 min., color As three teenagers learn more about diet, they recognize the importance of a balanced diet to weight, skin condition, and personality. The seven basic food groups are presented and illustrated.		

* Good
** Excellent

Human body (continued)

Name and Description of Film	Other Grade Placements	Remarks
4. Body Defenses Against Disease ** EBF, 1937; 11 min., black & white Demonstrates through animated drawings and cinemicrography the three lines of defense against infection--the skin and mucous membranes, the lymphatic system, and the circulatory system including liver and spleen. Explains immunity to certain diseases, and describes how man can improve defenses against infection.		
5. Body Fights Bacteria ** McGraw-Hill, 1948; 17 min., black & white Shows how the body sets up defenses against pathogenic bacteria, and stresses the roles of immunization and healthful living in protecting the body against disease. Includes animated drawings.	Gr. 7 - Gr. 10 - *	A little adv.
6. The Brain and Behavior ** McGraw-Hill, 1957; 22 min., black & white Demonstrates two ways to study the function of different brain areas in human behavior--to stimulate artifically different parts of the living brain with an electrode and observe the results, and to measure, by means of tests, the change in behavior following injuries to different areas of the brain.	Gr. 10 - **	

* Good
** Excellent

Human body (continued)

Name and Description of Film	Other Grade Placements	Remarks
7. Circulation ** United World, 1950; 16 min. Through animated diagrams of the human body describes the systemic and pulmonary circulation of the blood, the structure and functions of the heart, lungs, arteries, veins, and capillary network. Shows the route of the blood through the body, the heart cycle, and the exchange of oxygen and carbon dioxide in the air sacs of the lungs and in the cells of the body.		
8. Circulation and The Human Body ** Churchill, 1960; 10 min., color Explains the body cells' need for food and oxygen, their need to dispose of waste products, and their need for rest and exercise. Using animation, the film shows how blood returns from the cells to the heart through the capillaries and venous system, how the chambers of the heart pump the blood first through the pulmonary circulation, then back to the arterial system to the capillaries.		
9. Common Heart Disorders and Their Causes * McGraw-Hill, 1956; 17 min., black & white Compares the operations of a healthy heart and a disordered heart, describing the function of auricles, ventricles, and valves, and showing the directions of the blood flow in the heart. Explains how the heart is affected by disease, and points out the damage caused by rheumatic fever, hypertension, and arteriosclerosis. Discusses the prognosis for people with heart diseases. Includes animated sequences.	Gr. 10 - **	

* Good
** Excellent

Human body (continued)

Name and Description of Film	Other Grade Placements	Remarks
10. Community Health and You * McGraw-Hill, 1955; 19 min., black & white The local health department protects water and food supplies and insures proper disposal of garbage, sewage and insutrail wastes. Methods of purifying water, the functions of laboratory tests and vaccines in preventing the spread of communicable disease, and the cooperation of Red Cross, community hospitals and family physicians with the health department are discussed.	Gr. 7 - Gr. 5 - ** Gr. 10 - *	Also listed under Water A little diff. Easy film
11. Defense Against Invasion * Walt Disney, 1946; 13 min., color Explains how vaccination makes the body immune to certain diseases. Animated cartoon.	Gr. 5 - **	Has war theme
12. The Ears and Hearing * EBF, 1950; 10 min., black & white Describes the physiology of the human ear by means of animated drawings and close-up photography. Shows how the parts of the ear operate, and records some of the kinds of sounds. Explains three common causes of impaired hearing and demonstrates how a hearing aid is used.	Gr. 10 - **	

* Good
** Excellent

Human body (continued)

Name and Description of Film	Other Grade Placements	Remarks
13. Eyes and Their Care * EBF, 1941; 11 min., black & white Examines the eye in terms of structure, functions, disorders, and hygiene. Shows, with animated drawings, various parts of the eye and explains the physiology of sight. Illustrates such eye defects as near-sightedness, far-sightedness, and astigmatism, and describes their correction with glasses. Calls attention to eye infections, removal of foreign bodies, and damage by radiation.	Gr. 10 - **	
14. Gateways to the Mind ** N. W. Bell Tele., 1960; 59 min., color Everything man does, feels, and knows comes to him through his senses. They are "Gateways to the Mind". There are at least 14 senses, not five. This film stars Dr. Frank Baxter who explains the scientific discoveries.	Gr. 10 - **	
15. Heart and Circulation * EBF, 1937; 11 min., black & white Portrays how heart and blood vessels circulate blood throughout the body. Animated drawings depict the nature of the circulatory system and muscular and valvular heart action. Reveals factors affecting the rate of heart beat, flow of blood from a severed artery, and the effect of severing the cervical nerve. Through cinemicrography discloses capillary blood flow.	Gr. 10 - *	

* Good
** Excellent

Human body (continued)

Name and Description of Film	Other Grade Placements	Remarks
16. The Heart: How It Works ** McGraw-Hill, 1955; 11 min., black & white Animated diagrams demonstrate the functioning of the auricles, ventricles and valves of the heart, arteries, veins, the pulse, and how blood is pumped from the heart to all parts of the body and to the lungs. Methods of examining the heart are explained as are ways of keeping it strong and healthy. Film is correlated with Diahl and Laton's book "Health and Safety for You."	Gr. 5 - **	
17. Heart, Lungs, and Circulation ** Coronet, 1959; 11 min. Explains how the heart, lungs, veins, arteries and capillaries work together in the process of circulation. Uses animation, cinefluorography and a combination of artwork and a live subject to visualize the key functions. Suggests principles to help maintain healthy heart and lungs.	Gr. 5 - **	
18. Hemo, the Magnificent ** N. W. Bell, 1957; 59 min., color Produced by Frank Capra Productions. Tells the story of the blood, the heart and circulation. Shows scenes of the human heart and capillaries in action. Includes animation.	Gr. 5 - ** Gr. 10 - *	

* Good
** Excellent

Human body (continued)

Name and Description of Film	Other Grade Placements	Remarks
19. The Human Body: Circulatory System **	Gr. 5 - ** Gr. 10 - **	
20. The Human Body: Digestive System **	Gr. 10 - **	
21. The Human Body: Excretory System **	Gr. 10 - **	

19. The Human Body: Circulatory System **

Coronet, 1956; 14 min., color

Animation, cinefluorography, drawings and close-ups of live organs are used in analyzing the entire circulatory system. Explains in detail the functions of the heart, lungs, and kidneys; follows the flow of blood through all parts of the body; and explains the role of the circulatory system in maintaining good health.

20. The Human Body: Digestive System **

Coronet, 1962; 13½ min., color

Animation, x-ray, and live-action scenes of the major digestive organs give a detailed account of the function of this system to break down chemically the complex nutrients, carbohydrates, proteins, and fats into simple food materials. The roles played by the salivary glands, esophagus, stomach, pancreas, liver, gall bladder, and small and large intestines are clearly defined and related to each other.

21. The Human Body: Excretory System **

Coronet, 1960; 14 min., color

A step-by-step study of the structure and functions of the excretory system of the human body. Describes the kidneys in detail, explaining that through the processes of filtration of wastes, and the re-absorption of needed nutrients, the kidneys carry on their main function of regulating the composition of blood. Discusses the role of the skin in removing water from the body.

* Good
** Excellent

Human body (continued)

Name and Description of Film	Other Grade Placements	Remarks
22. The Human Body: Nervous System ** Coronet, 1962; 13½ min., color This film study of the nervous system emphasizes the basic functions of this system, its main organs, the various neuron of which these organs are composed and the principal areas of the brain. Microscopic views of nerve tissue, a specimen of a human brain, animation and anatomical charts will help students to visualize this complex system and gain a better understanding of its control of the body processes.	Gr. 10 - **	
23. The Human Body: Nutrition and Metabolism ** Coronet, 1962; 13½ min., color This film distinguishes between basal metabolism and active metabolism and expresses the energy requirements of metabolism in units of calories. The film discusses the five classes of chemical substances which comprise all natural foods--carbohydrates, fats, proteins, vitamins and minerals, and explains the basic chemistry by which they supply our bodies with energy and essential chemicals needed for growth and repair.	Gr. 10 - **	
24. The Human Body: Respiratory System ** Coronet, 1961; 14 min., color Locates and describes the organs of the respiratory system and shows in animation and live demonstration the mechanics of ventilation and the physics of diffusion between aveoli and capillaries. Illustrates the effect on the respiratory system of varying needs for oxygen, and the function of the respiratory system in providing needed oxygen and eliminating carbon dioxide.	Gr. 5 - ** Gr. 10 - *	

* Good
** Excellent

Human body (continued)

Name and Description of Film	Other Grade Placements	Remarks
25. The Human Body: Skeleton ** Coronet, 1962; 10 min., color This film's purpose is to visualize the most important parts of the human skeleton, especially in terms of action and coordination. Through the realistic technique of cinefluorography, the audience gains an overview of the skeletal structure, the complexity of the system, and how the skeleton protects, moves, and supports the body.		
26. The Human Skeleton ** United, 1951; 11 min., black & white Through the imposing of animated diagrams and x-ray photography, a human model demonstrates the functions of the skeleton in the support, protection, and movement of the body. Shows details of the structure and movements of various types of joints.	Gr. 5 - ** Gr. 10 - *	
27. Immunization ** EBF, 1947; 10 min., black & white Explains what immunization is and how immunity to infectious diseases is attained. Points out that immunity to some diseases is effected through actual illness, and then demonstrates how the injection of vaccine into the human body may build up resistance to an infection just as the actual illness would have done. Explains how vaccines for smallpox, pneumonia, and diphtheria are prepared and used.	Gr. 10 - *	

* Good
** Excellent

Human body (continued)

Name and Description of Film	Other Grade Placements	Remarks
28. Learning About Your Nose ** EBF, 1956; 9 min., black & white Explains how the nose serves as a hallway between the changeable outside world and sensitive breathing organs. Shows its functions and suggests better health habits.	Gr. 5 - **	
29. Mechanisms of Breathing ** EBF, 1936; 11 min., black & white Analyzes the function of respiration. Through animated drawings illustrates the work of the pharynx, larynx, trachea, bronchi, and bronchiole. Reveals the role of the phrenic nerve and the exchange of oxygen and carbon dioxide between air sacs and blood stream. Describes mechanisms correlating the rates of breathing and body activity. Demonstrates the principles of artificial respiration.	Gr. 10 - *	
30. The Nose--Structure and Function ** EBF, 1954; 11 min. Covers the function of the nose, the physiology of the nasal cavity and nasal hygiene.	Gr. 10 - **	
31. The Nose, Throat, and Ears * McGraw-Hill, 1948; 11 min., black & white Shows the structure and functions of the nose, throat and ears; illustrates how infections in these organs may spread and affect other parts of the body; and warns of the dangers of self-medication. Includes animated drawings.	Gr. 10 - **	

* Good
** Excellent

Human body (continued)

Name and Description of Film	Other Grade Placements	Remarks
32. Respiration ** United World, 1951; 14 min., black & white Describes internal and external respiration, showing distribution of oxygen by means of the circulatory system and release of energy within a muscle cell by means of oxidation of food substances.	Gr. 5 - * Gr. 10 - *	
33. Sniffles and Sneezes ** McGraw-Hill, 1961; 10 min., black & white Why colds start, how they spread and what to do to prevent them are shown in this film. By means of a unique device, the film effectively portrays the most common ways in which cold-producing viruses are spread. It also shows ways in which the body defends itself against germs.	Gr. 5 - **	
34. The Spinal Column ** EBF, 1956; 11 min., black & white Uses x-ray motion pictures three dimensional animation, and animated drawings to describe the various parts of the human spinal column. Identifies the major regions of the spine, shows how the parts fit together, and explains how they function in life.	Gr. 10 - **	

* Good
** Excellent

Human body (continued)

Name and Description of Film	Other Grade Placements	Remarks
35. Tissues of the Human Body **		
Churchill, 1963; 17 min., color		
Compares the life processes of the one-celled organism with the human. Uses animation to illustrate the variety of cell specialization in man. Presents in detail the organization of the more important kinds of tissue in skin, in tendon, and in bone; blood considered as a tissue; muscle tissue; and nerve tissue.		
36. Visual Perception *	Gr. 7 -	Adv.
	Gr. 10 - **	
Educ. Test. Serv., 1959; 20 min., color	Gr. 5 - *	Diff.
Dr. Hadley Cantril discusses his investigations at the Perception Demonstration Center at Princeton University of the effects of some of our assumptions on what we see. Shows a distorted room that looks normal, with illustrations that include a rotating trapezoid that appears to oscillate, balloons that seem to move when in reality they are being inflated and deflated, or illuminated and darkened.		
37. Work of the Blood **	Gr. 5 - **	
	Gr. 10 - **	
EBF, 1957; 13 min.		
Reveals through laboratory analysis of a blood sample the structure of blood cells and the composition of plasma. Animated drawings and x-ray motion pictures of the circulatory system illustrate the work of the blood in circulating food elements and other materials to body cells, removing wastes, equalizing heat distribution, and providing defenses against disease. Demonstrates methods of typing blood and giving transfusions.		

* Good
** Excellent

Human body (continued)

Name and Description of Film	Other Grade Placements	Remar
38. You and Your Ears ** Walt Disney, 1957; 9 min., color Jiminy Cricket explains the structure of the ear and shows how sound waves affect the ear.	Gr. 5 - **	
39. You and Your Eyes ** Walt Disney, 1956; 10 min., color Jiminy Cricket explains that, though eyes always serve for protection, human eyes differ from those of other animals. Because our eyes are constructed with both rods and cones, we can read, distinguish color, and judge distances. Other animals, such as chickens, frogs, and bees cannot. Because eyes are so important, we must observe a few simple health rules to protect them.	Gr. 5 - **	
40. Your Health: Disease and Its Control ** Coronet, 1954; 11 min. Shows how harmful microbes are carried and spread; explains how they enter the body, overcome body defenses, and cause illness; stresses the importance of maintaining good health habits in order to prevent disease. Includes photomicrography and animated sequences.	Gr. 5 - ** Gr. 1 - *	

* Good
** Excellent

SCIENCE MOTION PICTURE FILMS - Grade Seven
(Addendum)

Additions to
Page 73

II. Living Things

Human Body

Name and Description of Film	Other Grade Placements	Remarks
Infectious Diseases & Natural Body Defenses * Coronet, 1961; 11 min., color Presents the dynamics of the body's natural defenses against disease. Illustrates, by animation, the particular organs of the body that function in resisting and combatting infection. Describes the work of mucus and Cilia, the white blood cells, the filtering action of the blood and how antibodies work.		
New Lives For Old * Educational Testing Service; 1960, 20 min., color Dr. Margaret Mead, anthropologist of the American Museum of Natural History, presents a pictorial record of the rapid transition of the island dwelling people of New Guinea from the stone age to the threshold of modern civilization, with a particular study of the sea dwelling Manus tribe of the Admiralty Islands. Shows how the anthropologist goes about his work, using the lives of different peoples as laboratories in which to study how human culture is developed and how it changes.	Gr. 10 - **	

* Good
** Excellent
5-9-67

Human body (continued)

Name and Description of Film	Other Grade Placements	Remarks
41. Your Voice * EBF, 1949; 11 min., black & white Describes the four phases of voice production: respiration, phonation, resonance and articulation. Presents actual photographs of the vocal folds in operation. Animated drawings, together with demonstration material, explain the various processes. Emphasizes the role of proper exercises for improving the voice. Illustrates the use of the voice in speaking and singing.	Gr. 5 - * Gr. 10 - **	

* Good
** Excellent

I. The Earth

Water

Name and Description of Film	Other Grade Placements	Remarks
1. Community Health and You * McGraw-Hill, 1955; 19 min., black & white The local health department protects water and food supplies and insures proper disposal of garbage, sewage and insutrail wastes. Methods of purifying water, the functions of laboratory tests and vaccines in preventing the spread of communicable disease, and the cooperation of Red Cross, community hospitals and family physicians with the health department are discussed.	Gr. 7 - Gr. 5 - ** Gr. 10 - *	Also listed Human Body A little diff. Easy film
2. Conserving Our Water Resources Today ** Coronet, 1962; 11 min., color Presents the importance of water resources. Depicts the increased water needs. Shows ways to conserve water -- conserving ground water, holding surface water, purifying and reusing water and salt water conversion.	Gr. 4 - *	
3. Corralling the Colorado ** U.S. Bur. of Reclamation, 1951; 33 min., b&w Reviews the history of deserts, droughts, and floods in the Southwest; and shows how Hoover, Davis, Parker, and Imperial Dams now control the Colorado River and provide irrigation and power to the people of the region.		

* Good
** Excellent

Water (continued)

Name and Description of Film	Other Grade Placements	Remarks
4. Irrigation Farming ** EBF, 1951; 10 min., black & white Describes the need for irrigation in certain sections of the U.S. and points out a natural source of irrigation water. Portrays the role of Boulder Dam in utilizing this source of irrigation. Illustrates irrigation by furrow and flooding methods, canvas dam, flooding and sprinkling. Points out ways in which farming by irrigation leads to mutual planning among neighbors.	Gr. 4 - **	
5. Lakes and Streams of Minnesota ** U of M, 1950; 16 min., color A pictorial presentation of the water pollution problem in Minnesota as it existed in 1949. Depicts scenes of the benefits of clean, pure waters in health, sports and recreation, industry, and agriculture. Illustrates and contrasts the shocking effects of untreated sewage and industrial wastes in many of the streams of the State. Concluding scenes present several types of treatment plans to restore streams to their natural condition.		
6. Man's Problem ** EBF, 1953; 19 min., color Explains that man's increasing need for water has resulted in the building of aqueducts, reservoirs and dams. Explains that man may assure himself of an adequate water supply by preserving nature's resources, by working with engineers, conservationists and scientists, and by taking proper care of forests, land and rivers that make up the water sheds.	Gr. 4 - ** Gr. 10 - *	

* Good
** Excellent

Water (continued)

Name and Description of Film	Other Grade Placements	Remarks
7. Nature's Plan ** EBF, 1953; 14 min., color Describes the natural water cycle by which water from the ocean is drawn into the air by evaporation, formed into clouds, condensed into water, delivered to the earth, and returned to the ocean. Shows that nature provides watersheds where water is stored and distributed to the earth by streams and rivers.	Gr. 4 - **	
8. The Restless Sea - Part I and Part II Bell Telephone Co., 1963; 60 min., color Presents a wide-ranging report on the vast and mysterious "inner space" that covers nearly three quarters of the earth's surface--the sea. Illustrates in animated and filmed sequences the work of oceanographers in searching out the complex and interwoven relationships of nature in the sea. Shows hurricanes and mountainous waves; marine life from microscopic plankton to the largest mammals; movements of tides and currents; composition of sea water; topography of the ocean floor, with its great seamounts, sunken islands and submarine canyons and trenches. The only "character" that appears is a cartooned drop of water, who helps to explain the various phenomena.	Gr. 7 - Gr. 4 - Gr. 8 -	No eval. yet No eval. yet No eval. yet

* Good
** Excellent

Water (continued)

Name and Description of Film	Other Grade Placements	Remarks
9. Tale of the Twin Cities ** U of M, 1949; 20 min., color Explains how residents of the Twin Cities united to remedy the unsanitary conditions of the Mississippi River in their area, and how city cooperation and planning led to the construction of a plant for the chemical treatment of sewage. Includes a tour of the sewage plant showing the machines for the removal of sludge solids, chemists making tests, the settling tanks, incinerators, etc. Emphasizes the necessity of clear natural waters to maintain the public health.		
10. A Visit to the Waterworks * EBF, 1956; 11 min. Shows an elementary school class being taken on a tour of the local waterworks. Demonstrates how water is pumped in, chemically treated, filtered, and tested before it is piped to houses and buildings of the town. Points out major water supply sources and illustrates various uses of the community water supply.	Gr. 4 - * Gr. 3 - *	With prep.
11. Water and What It Does ** EBF, 1962; 11 min., color Some basic concepts about the nature and properties of water are illustrated. The dissolving property of water is demonstrated by adding sugar to it. Evaporation is illustrated by watching clothes drying outdoors and by seeing water vapor rise from a teakettle. Condensation and expansion of water is demonstrated. A balloon stretched over the neck of a flask expands as water is heated and vapor (or gas) is formed. A locomotive, driven by the force of expanding water vapor, shows the power of steam and some of its uses.	Gr. 3 - Gr. 6 - **	No eval. yet

* Good
** Excellent

Water (continued)

Name and Description of Film	Other Grade Placements	Remarks
12. Water for Dry Land: U.S.A.--the Southwest ** United World, 1949; 20 min., black & white Shows how the desert is transformed into fertile farms and industrial cities as a result of building dams, development of irrigation projects, and generation of electricity to supply power.	Gr. 4 - *	
13. Water Supply ** Academy Films, 1947; 11 min. Describes how a water supply is obtained in different parts of the country. Through animated diagrams demonstrates how water soaks into the ground and is stored as ground water. Shows how water is obtained by springs, artesian wells, hand pumps, windmills, bucket wells and electric pumps. Explains that cities in dry areas of the U.S. must bring their water supply from great distances, and shows how water for the city of Los Angeles is brought from the Colorado River some 300 miles away. Notes that research and testing assures a pure water supply.	Gr. 4 - **	
14. What's Under the Ocean ** Film Assoc. of Calif., 1959; 12 min., color Scientists study the ocean in many ways. Some take cameras to study plants and animals in shallow depths. Some go to the deepest ocean floor in special craft like abathyscaph. Some use instruments on research ships to study bottom materials and to map vast areas of the ocean floor. They have found a long mountain range dividing the Atlantic in two and in the Pacific, thousands of volcanoes and many deep trenches.	Gr. 4 - ** Gr. 8 - ** Gr. 7 -	Also listed Plants & Animals

* Good
** Excellent

I. The Earth

Air

	Name and Description of Film	Other Grade Placements	Remarks
1.	Air All Around Us ** Young America, 1948; 10 min., black & white Explains the properties of air by demonstrating that air is a substance which exerts pressure, expands and contracts, and can be compressed.	K - ** Gr. 4 - ** Gr. 6 - *	Adv.
2.	Atmospheric Pressure ** EBF, 1926; 12 min., black & white Illustrations of unbalanced air pressure, including the Madgeburg hemisphere demonstration. Shows atmospheric variations in pressure between valley and hilltop and between land and water.	Gr. 7 - Gr. 9 - *	Adv.
3.	Fuels--Their Nature and Use ** EBF, 1958; 11 min. Describes the principal kinds of fuels used in homes and industry; traces the source of most conventional fuels to the sun; and explains the history of fuels. Uses animation to explain how heat is transferred to mechanical energy in steam, gasoline, and diesel engines.	Gr. 5 - ** Gr. 9 - ** Gr. 11 - *	
4.	How Man Made Day Coronet, 1946; 11 min. Traces the development of illumination from primitive to modern times. Shows how man learned to reduce the heat and increase the light of fire until night was turned into day by means of artificial light.	Gr. 7 - Gr. 11 -	No eval. yet No eval. yet

* Good
** Excellent

Air (continued)

Name and Description of Film	Other Grade Placements	Remarks
5. Understanding Fire ** Coronet, 1956; 10 min. A young boy, helping his father to build a fire in an outdoor fireplace, becomes interested in the characteristics of fire and its uses. He learns that the basic requirements of fire are fuel, heat, and oxygen, and realizes that the usefulness of fire depends upon its control.	Gr. 7 - Gr. 5 - * Gr. 3 - ** Gr. 4 - **	For slow 7th Easy film
6. The Wind at Work ** Pat Dowling, 1960; 11 min., color Shows how the earth and our lives are influenced by the natural force of wind, explaining that winds change the face of the land, help planes to fly and boats to sail, disperse the seeds of plants, and bring rain and snow. Live photography, illustrations and animation describes what makes the wind and what the wind does; simple experiments show the effect of warm and cold air.	Gr. 4 - **	

* Good
** Excellent

BIB. FILMSTRIPS

For discussion purposes only

SCIENCE FILMSTRIPS

(35 mm.)

for
Grade Seven

Correlated to the Major Topics and/or Units
as found in the
Reorganized Science Curriculum

Minneapolis Public Schools
Science Department
4-18-67

For discussion purposes only Grade Seven

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The annotations for filmstrips found on the following pages were obtained from sources such as the Wilson's Filmstrip Guide, producers' catalogs, and the Library of Congress cards.

Introduction to Science

A. Definition of science and scientists

Name and Description of Filmstrip	Other Grade Placements	Remarks
1. Scientists at Work * American Gas Association Educational Service Bureau, 46 fr., b/w Designed to show an image of the scientist. His contributions and procedures are stressed. Thinking, designing experiments and recording data are emphasized. Activities such as life of keeping up-to-date and reporting his work are discussed. Natural gas and science occupations are related at the close of the strip.	Gr. 4 ** Gr. 6 * Gr. 8 *	

* Good
** Excellent

II. Living Things

A. Life processes of living things

Name and Description of Filmstrip	Other Grade Placements	Remarks
1. Animal Behavior ** Curriculum, rev. 1960; 29 fr., color (Stimulus and Response ser., 5 f.s.) $4.50 Explains that food getting behavior in "advanced" animals is more complex than in "simple" animals; and that animals respond to the need for self-protection, mating, and caring for their young.	Gr. 5 - **	
2. The Behavior of Plants ** Curriculum, rev. 1960; 30 fr., color (Stimulus and Response ser., 5 f.s.) $4.50 Explains typical plant responses to stimuli such as sunlight, moisture, and the pull of gravity.	Gr. 5 - *	Listed under II - E
3. The Behavior of Simple Animals ** Curriculum, rev. 1960; 29 fr., color (Stimulus and Response ser., 5 f.s.) $4.50 Shows that simple microscopic animals have the same fundamental patterns of behavior that are seen throughout the animal kingdom.	Gr. 5 - *	
4. How Living Things Respond ** Curriculum, rev. 1960; 30 fr., color (Stimulus and Response ser., 5 f.s.) $4.50 Shows that all living things respond to the stimuli of immediate situations.		

* Good
** Excellent

II. Living Things - A (continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks
5. Insects That Live in Societies ** EBF 1961; 52 fr., color (The Insects series, 4 f.s.) $6.00 each Describes how the term "social" applies to some insects. Tells how the functions of social insects vary among individuals within colonies. Explains how new colonies of social insects are started. Reveals some important aspects of the relationship of social insects to man.	Gr. 5 - *	Difficult vocabulary
6. Learned Behavior ** Curriculum, rev. 1960; 29 fr., color (Stimulus and Response ser., 5 f.s.) $4.50 each Discusses unlearned and learned behavior in animals and in people, and explains the importance of learned behavior in our lives.	Gr. 5 - **	
7. Testing Foods and Nutrients * McGraw-Hill Book Co., (General Science series, Set No. 1), 7 f.s.; $6.75 each, $42.50 set, 1953 The filmstrip opens with a definition of nutrients, and then shows the types of nutrients. First carbohydrates are examined, then foods are tested for starch and sugar. Next foods are tested for the common nutrient, fat, by means of paper or a solvent. Tests are made for proteins; then the student sees how minerals are removed from foods by ashing. After the test for the common mineral salt, the students learn how to test for vitamins A and C and how the tests are applied to food.		

* Good
** Excellent

II. Living Things - A (continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks
8. Ways of Starting New Plants * McGraw-Hill Book Co., (General Science series, Set No. 1), 7 f.s.; $6.75 each, $42.50 set 1956 Describes the seed-production process of flowering plants. Shows the relationship of seed production to fruits; examines the parts of plants associated with plant reproduction; discusses vegetative propagation; and illustrates how man uses cuttings and grafts to start new plants.		

* Good
** Excellent

II. Living Things

C. Taxonomy (differences and similarities)

Name and Description of Filmstrip	Other Grade Placements	Remarks
1. Amphibians * EBF 1962; 44 fr., color, (Classification of Living Amphibians & Reptiles ser., 4 f.s. $ The main subdivisions (orders: Caudata, Salientia, and Apoda) of the subphylum AMPHIBIA are listed, and representative animals for each order are shown. The scientific basis for the classification of amphibians is the unifying factor around which the series of pictures is organized. Characteristics which distinguish amphibians from other animals are pointed out. Pictures portray common animals which students are likely to encounter in the field.		
2. Bats - Helpful and Harmful ** Jam Handy Organization, 1962; 38 fr., color (Animals - Helpful and Harmful series, 6 f.s.) $5.75 each The distinctive features of bats, false impressions about these animals, how they are helpful by destroying harmful insects and providing fertilizer, how they can be harmful.	Gr. 5 - **	Listed under II - E
3. Birds - Helpful and Harmful ** Jam Handy Organization, 1962; 42 fr., color (Animals - Helpful and Harmful series, 6 f.s.) $5.75 each The characteristics of birds, how they are alike, how they are different, their many helpful functions in the life of man, how some birds can be destructive or annoying.	Gr. 5 - **	

* Good
** Excellent

II. Living Things - C (continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks
4. **Bugs and Their Relatives** * EBF., 1962; 43 fr., color, $6.00 each (Orders of Insects series, 8 fs.) Discusses the orders Hemiptera and Homoptera, using close-up photographs to show their general wing structure and adaptive features.	Gr. 10 - Biology **	
5. **Crocodilians and Lizards** ** EBF, 1962; 44 fr., color, (Classification of Living Amphibians & Reptiles ser. 4 f.s.) $ The distinguishing characteristics of the gavials, crocodiles, alligators, and caimans are visually illustrated. A side-by-side picture compares the American crocodile and alligator. The relationship of lizards to snakes is pointed out. Various common species of lizards are shown. Some of the less common species pictured are the legless show "Worm", snake lizard, gila monster, monitor, and true chameleon. Two pictures of the rare tuatara are also included.		
6. **Fish and Amphibians** ** Jam Handy Organization, 1962; 45 fr., color (The Classification of Animals series, 7 f.s.), $5.75 each General characteristics of the animals in the phylum Chordata and the subphylum Vertebrae, the structure, appearance and living habits of various fish and amphibians (frog, toad, salamander) detailed description of amphibian metamorphosis.	Gr. 10 - Biology **	

* Good
** Excellent

II. Living Things - C (continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks
7. Harmful Insects ** Jam Handy Organization 1962; 45 fr., color (Animals - Helpful and Harmful series, 6 f.s.) $5.75 each The great variety of harmful insects, how and why they are so harmful to man in matters of health and economics, what man and nature do to combat their harmfulness.	Gr. 4 - * Gr. 5 - **	Listed under II - D II - E
8. Helpful Insects ** Jam Handy Organization, 1962; 39 fr., color (Animals - Helpful and Harmful series, 6 f.s.) $5.75 each The characteristics of all insects, the bee, the most helpful insect, some moths, beetles and other insects and why they are so valuable to man.	Gr. 4 - * Gr. 5 - **	Listed under II - D II - E
9. How Animals Are Classified ** Jam Handy Organization, 1962; 35 fr., color (The Classification of Animals series, 7 f.s.) $5.75 each Why classification is necessary, how our present system of classification began, a complete, step-by-step classification of a specific animal, the horse.	Gr. 10 - Biology **	
10. Insects: Harmful and Useful ** EBF 1961; 45 fr., color (The Insects series, 4 f.s.) $6.00 each Tells some ways insects transmit diseases. Shows how some harmful insects are controlled. Explains how insects destroy crops. Points out how some insects benefit mankind. Introduces some natural enemies of insects.	Gr. 5 - **	

* Good
** Excellent

II. Living Things - C (continues)

Name and Description of Filmstrip	Other Grade Placements	Remarks
11. The Joint-legged Animals ** Jam Handy Organization, 1962; 44 fr., color (The Classification of Animals series, 7 f.s.) $5.75 each Distinctive features of the animals in the phylum Arthropoda--insects, arachnids (spider, scorpion, mite, tick), crustaceans (crayfish, lobster, crab, shrimp, barnacle), myriapods (centipede, millipede).	Gr. 10 - Biology **	
12. The Life Cycles of Insects ** EBF 1961; 51 fr., color (The Insects series, 4 f.s.) $6.00 each Explains what is meant by metamorphosis. Shows the kinds of metamorphosis. Portrays activities characteristic of the stages of metamorphosis. Tells some characteristics of metamorphosis which aid the survival of the species.	Gr. 5 - **	Difficult vocabulary
13. Mammals ** Jam Handy Organization, 1962; 41 fr., color (The Classification of Animals series, 7 f.s.) $5.75 each Over-all characterstics of this class and the sub-classes egg-laying mammals, pouched mammals, true mammals, notable features of some of the principal orders of true mammals.	Gr. 10 - Biology **	
14. Moths and Butterflies * EBF, 1962; 48 fr., color, $6.00 each (Orders of Insects series, 8 f.s.) Reviews the life cycle of the order Lepidoptera, and defines the distinctions between moths, butterflies, and skippers.	Gr. 10 - Biology **	

* Good
** Excellent

II. Living Things - C (continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks

15. Reptiles and Birds **

Jam Handy Organization, 1962; 43 fr., color
(Classification of Animals series, 7 f.s.)
$5.75 each

The basic characteristics and living habits of reptiles (turtle, snake, lizard, crocodilian, tuatara) and birds, special emphasis on birds, structural features for flying and special adaptations.

16. Roll Call of the Plants **

McGraw-Hill, 1957; 39 fr., color
(General Science Series, Set 4)
6 f.s., $6.75 ea., $36.50 set

Presents the classification system used for plants, observes typical plants of each phylum, and compares the types of plants in different phyla, pointing out typical structural difference.

17. Simple Animals **

Jam Handy Organization, 1962; 45 fr., color
(Classification of Animals series, 7 f.s.)
$5.75 each

Characteristics of the animals in the following phyla; Protozoa (false-footed, flagellated, ciliated, spore-bearing), Porifera (sponges), Coelenterata (hydra, anemones, jellyfish, corals).

* Good
** Excellent

II. Living Things - C. (continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks
18. Snakes * EBF, 1962, 44 fr., color, (Classification of Living Amphibians & Reptiles series) 4 f.s. Herpetologists have classified snakes into eleven families. This filmstrip points out essential features which characterize the families of snakes, and provides pictures to illustrate representative members. Beside full views of many snakes, close-up pictures are used to illustrate specific characteristics; a snake's forked tongue, vestigial limbs of a python, pit of a viper, position of prey in a rear-fanged snake's mouth, defensive positions of a hognose snake, and rattles of a rattlesnake.		
19. Snakes - Helpful and Harmful ** Jam Handy Organization, 1962; 44 fr., color (Animals - Helpful and Harmful series) 6 f.s., $5.75 each The general characteristics of snakes, how most help man by destroying harmful rodents, the four North American poisonous snakes, how they can be recognized, their general range.	Gr. 5 - **	Listed under II. - E.
20. Spiders - Helpful and Harmful ** Jam Handy Organization, 1962; 41 fr., color (Animals - Helpful & Harmful series) 6 f.s., $5.75 each How spiders are distinguished from insects, their helpfulness through such functions as eating harmful insects, different types of spiders and webs, the harmful black widow.	Gr. 5 - **	

* Good
** Excellent

II. Living Things - C. (Continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks
21. Turtles **		
EBF, 1962; 44 fr., color (Classification of Living Amphibians & Reptiles series) 4 f.s.		
This filmstrip suggests reasons why this family of reptiles has survived for millions of years; adaptive features which have helped them survive are visualized. Close-up color pictures together with instructive captions are designed to aid students to recognize members of important turtle families, included are the alligator and snapping turtle, mud turtle, blanding's turtle, box turtle, sea turtle, matamata, soft-shelled turtle, and others.		
22. Worms, Mollusks & Spiny Skinned Animals **		
Jam Handy Organization, 1962; 44 fr., color (Classification of Animals series) $5.75 each		
Characteristics of the animals in the following phyla; Platyhelminthes (planaria, tapeworm, fluke), Aschelminthes (horsehair snake, rotifer, hookworm, vinegar eel, Ascaris, trichina worm, leech), Mollusca (clam, scallop, oyster, Mussel, snail, squid, octopus), Echinodermata (starfish, brittle star, sand dollar, sea cucumber, feather star).		
23. What Is an Insect? **	Gr. 5 - **	Difficult vocabulary
EBF, 1961; 54 fr., color (The Insects series,) 4 f.s., $6.00 each		
Describes and visualizes the structural characteristics of insects. Explains the origin of insects. Shows some structural differences between some insects. Portrays some advantages insects have in their struggle for survival.		

* Good
** Excellent

II. Living Things

D. Ecology

Name and Description of Filmstrip	Other Grade Placements	Remarks

1. **Adaptations To Environment** **

McGraw-Hill Book Co., 1964, 47 fr., color
(Ecology & Man Series - Set 1)

Shows a variety of plant and animal adaptations to environments. It then considers how environmental changes contribute to the evolution of species. A degree of randomness of genetic material produces differences among individuals of species. The variants best fitted to life in the environment into which they are born will survive and reproduce; others will tend to die sooner. Thus environment selects the genetic factors passed on to the next generations. As ecosystems change, different characteristics become selected.

2. **Animal Life & The Soil** *

EBF, 1950; 54 fr., black & white
(Soil Conservation Series)
8 f.s., $3.00 ea., $24.00 set

Shows how animals within the soil and on the surface contribute to soil formation and fertility; points up relationships between domestic animals and the soil.

3. **Animal & Plant Communities: Forest** **

McGraw-Hill Book Co, 1961; 40 fr., color
(Interdependence of Living Things Series)
6 f.s., $6.75 each, $36.50 set

Examines the composition and structure of the forest, its plant and animal associations, and the variations that occur in these associations with the normal process of change in the forest.

* Good
** Excellent

II. Living Things - D. (continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks

4. Animal & Plant Communities: Pond **

McGraw-Hill Book Co, 1961; 40 fr., color
(Interdependence of Living Things Series)
6 f.s., $6.75 each, $36.50 set

Pond vegetation and its associated animal life are shown to be concentrically zoned by differences in depth. The pond food chains are described. It is pointed out that succession in a pond, caused by the continuous filling with organic and inorganic sediments, may eventually teach completion with the establishment of the hard-wood forest stage.

5. The Ant **

Jam Handy; 1966; 33 fr., color
(Insect Societies)
3 f.s., $5.95 ea., $16.55 set

This filmstrip helps the student explore an ant city. The roles of the queen, the worker and the male are outlined. The filmstrip illustrates how each ant has a specific duty. It sketches the different kinds of work that ants perform. All aspects of the ant society are visualized.

6. Can The Biologist Meet The Demand *

EBF - Science & Natural Resources, 1958
34 fr., color; (Conservation Foundation)
3 f.s., $6.00 each

Using corn as an example, shows how biologists have been able to increase supply, and hints at possible future production. Points out the water shortage as a factor which the biologist can not avoid or eliminate. Asks how this shortage affects produce and people.

* Good
** Excellent

II. Living Things - D. (Continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks

7. Can The Chemist Renew The Supply? *

Conservation Foundation & Encyclopaedia
Britannica Films, 1958, 34 fr., color
(Science & Natural Resources Series)
3 f.s., $6.00 each

Discusses the role of the chemist in solving problems associated with the low supply of basic resources, and explains how chemists have developed nitrates for soil improvement. Poses questions regarding the contribution of chemistry in developing substitutes for basic materials and resources that may become depleted in the future.

8. Changes In Ecosystems **

McGraw-Hill Book Co., 1964, 45 fr., color
(Ecology & Man Series - Set 1)

Ecosystems, populated with living, growing, and reproducing organisms, are dynamic, not static. Each ecosystem is changing constantly. Each change favors some species and affects others unfavorably. The productivety of an ecosystem may increase or decrease, with corresponding effect on the total number and kinds of consumers. Both plant and animal species may be replaced by others. Ecosystem boundaries may change.

* Good
** Excellent

II. Living Things - D. (Continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks

9. Deep Frontier **

Felton Design Studio, 1961, 83 fr., color (An Introduction to Oceanography, accompanied by 12" record 33-1/3 RPM)

An overview of what we know about the ocean and how we find information about the ocean. Sonar mappings of the ocean floor, corings of sediments, and the characteristics of the ocean waters at various depths are shown. Other aspects of oceanography, marine biology and marine mining, are explored. Oceanographic instrumentation is depicted by the Nansen bottle, the bathyscaph, floating laboratories and projected into the future. An appeal is made to interest students in the study of the ocean - "the lost frontier".

10. Energy Relationships **

McGraw-Hill Book Co., 1964, 50 fr., color (Ecology and Man Series - Set 1)

Probably the most important single concept for the student to grasp is the flow of energy from the sun to and through living organisms. Solar energy, suitably modified by the atmosphere and hydrosphere, is also fundamental to a physical environment in which life can exist. The filmstrip describes a complex of energy relationships and transformations.

* Good
** Excellent

II. Living Things - D. (Continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks
11. Habitats & Niches ** McGraw-Hill Book Co., 1964, 51 fr., color (Ecology & Man Series - Set 1) Why do plants of a given species grow in some places but not in others? What limits the range of an animal species? The filmstrip deals with both questions in ecological terms. Habitat refers to the kind of place where a species lives, including such characteristics as climate, moisture supply, terrain, and available food. The ecological niche of a species is the pattern of its interactions and relationships within the habitat. The filmstrip considers such relationships as symbiosis, competition and parasitism.		
12. Harmful Insects ** Jam Handy Organization, 1962; 45 fr., color (Animals - Helpful & Harmful Series) 6 f.s., $5.75 each The great variety of harmful insects, how and why they are so harmful to man in matters of health and economics, what man and nature do to combat their harmfulness.	Gr. 4 - * Gr. 5 - **	Listed under II - C II - E
13. Helpful Insects ** Jam Handy Organization, 1962; 39 fr., color (Animals - Helpful and Harmful Series) 6 f.s., $5.75 each The characteristics of all insects, the bee, the most helpful insect, some moths, beetles and other insects and why they are so valuable to man.	Gr. 4 - * Gr. 5 - **	Listed under II - C II - E

* Good
** Excellent

II. Living Things - D. (Continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks

14. The Honeybee **

Jam Handy Organization; 1966, 39 fr., color
(Insect Societies)
3 f.s., $5.95 each, $16.55 set

This filmstrip tells the fascinating story of the life cycle of the honeybee. It shows life in the hive. How each bee has a specific task to perform in the hive is pictured. The honey-making process is exhibited in detail.

15. How Man Conserves The Soil *

EBF; 1950, 60 fr., black & white
(Soil Conservation Series)
8 f.s., $3.00 each

Demonstrates the meaning of soil conservation; shows actual practices used to protect soil and prevent erosion; portrays the role of individuals and organizations in promoting conservation.

16. How We Get It *

EBF; 1958, 34 fr., color
(Natural Resources and You)
3 f.s., $6.00 each

Example of a snail in a glass globe shows what it means to be trapped by environment; then shows how man is trapped by the environment of the earth itself. Explains what happens when demand increases and supply does not. Discusses ways of increasing supply emphasizes difficulties of this in regard to water--asks consequences if demand continues to rise.

* Good
** Excellent

II. Living Things - D. (Continued)

Name and Description of Filmstrip	Other Grade Placements	Remark
17. Insects: Harmful and Useful ** EBF; 1961; 45 fr., color (The Insects Series,) 4 f.s., $6.00 each Tells some ways insects transmit diseases. Shows how some harmful insects are controlled. Explains how insects destroy crops. Points out how some insects benefit mankind. Introduces some natural enemies of insects.	Gr. 5 - **	Listed under II - C II - E
18. Introduction To Ecology ** McGraw-Hill Book Co., 1964; 51 fr., color (Ecology and Man Series - Set 1) Ecology is defined as the study of relationships among plants and their associated animals, and between them and their environments.		
19. The Oceans: Our Inner Space ** Heath; 53 fr., color (Ecology) 8 f.s., 1 f.s.; 1 f.s. Electrical Energy; 1 f.s. Atomic Structure & Nuclear Energy; 2 f.s. Human Body; 2 f.s. Astronomy; 1 f.s. Geology Oceanography today is an important and rapidly growing science. This filmstrip discusses some of the reasons for our interest in the sea, and surveys some of the progress made by oceanographers. The filmstrip also reviews the importance of oceans in the past, and predicts a growing dependence on them in the future.		

* Good
** Excellent

II. Living Things - D. (Continued)

Name and Description of Filmstrip | Other Grade Placements | Remarks

20. Plant Life And The Soil *

EBF; 1950; 61 fr., black & white
(Soil Conservation Series)
8 f.s., $3.00 each

Shows the importance of plant life to soil formation and conservation; explains the concept of climax forests in relation to soil development and maturity; discusses humus as a factor in soil fertility.

21. Populations & Biomass **

McGraw-Hill Book Co., 1964, 48 fr., color
(Ecology and Man Series - Set 1)

The chief purpose of this filmstrip is to introduce the quantitative aspects of ecology: productivity, population, species density, natality, mortality, and so on.

22. The Wasp **

Jam Handy, 1966; 34 fr., color
(Insect Societies)
3 f.s., $5.95 ea., $16.55 set

In clear pictures and simple words is traced the life cycle of the paper wasp. How the wasps live and work together in their colonies is graphically portrayed.

* Good
** Excellent

II. Living Things - D. (Continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks
23. What We Need * EBF, 1958; 34 fr., color (The Conservation - Natural Resources And You) 3 f.s., $6.00 each Lists needs of living things, especially of your children, and shows how all these things can not be obtained by one person. Includes water, air, space and other demands made only by human beings. Explains that environment must include these things and shows some which do not - desert air pollution, etc.		

* Good
** Excellent

II. Living Things

E. Economic value of living things

Name and Description of Filmstrip	Other Grade Placements	Remarks
1. Combatting Insect Pests ** McGraw-Hill Book Co., 1951; 42 fr., color (General Science Series - Set 1) 7 f.s., $6.75 each, $42.50 set Discusses the problems involved in combatting insects; shows the life cycles of various insects; describes methods of combatting insects; and includes views of harmful insects.		
2. Harmful Insects ** Jam Handy Organization, 1962; 45 fr., color (Animals - Helpful & Harmful Series) 6 f.s., $5.75 each The great variety of harmful insects, how and why they are so harmful to man in matters of health and economics, what man and nature do to combat their harmfulness	Gr. 4 - * Gr. 5 - **	Listed under II - C II - D
3. Helpful Insects ** Jam Handy Organization, 1962; 39 fr., color (Animals - Helpful & Harmful Series) 6 f.s., $5.75 each The characteristics of all insects, the bee, the most helpful insect, some moths, beetles and other insects and why they are so valuable to man.	Gr. 4 - * Gr. 5 - **	Listed under II - C II - D

* Good
** Excellent

II. Living Things - E. (Continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks
4. Insects: Harmful and Useful ** EBF; 1961; 45 fr., color (The Insects Series) 4 f.s., $6.00 each Tells some ways insects transmit diseases. Shows how some harmful insects are controlled. Explains how insects destroy crops. Points out how some insects benefit mankind. Introduces some natural enemies of insects.	Gr. 5 - **	Listed under II - C II - D
5. Snakes - Helpful and Harmful ** Jam Handy Organization, 1962; 44 fr., color (Animals - Helpful & Harmful Series) 6 f.s., $5.75 each The general characteristics of snakes, how most help man by destroying harmful rodents, the four North American poisonous snakes, how they can be recognized, their general range.	Gr. 5 - **	Listed under II - C
6. The Demand * EBF; 1958; 36 fr., color (Science & Natural Resources Series) 3 f.s. In collaboration with Conservation Foundation Discusses the great demand upon the earth which is made by every individual for agricultural products, fuel, metals and building materials. Explains that citizens of the United States use more resources per year than people in any other country, and points out that the demand increases each year as the population of the world increases.		Also listed II - G

* Good
** Excellent

II. Living Things

F. Man's protection of wildlife

Name and Description of Filmstrip	Other Grade Placements	Remarks
1. Can The Physicist-Engineer Strike A Balance? EBF, 1958; 33 fr., color (Science & Natural Resources Series) 3 f.s., $6.00 each Explains that efficient machinery has replaced much manpower on farms and that as a result rural population has decreased and urban population increased. Points out living space problems in cities and suburbs, and the spread of urban areas to land needed for farming. Poses questions on urban and regional planning.	*	

* Good
** Excellent

II. Living Things

G. Human body

Name and Description of Filmstrip	Other Grade Placements	Remarks
1. Circulation ** McGraw-Hill Book Co., 40 fr., color (High School Biology Series) 6 f.s., $6.75 each, $36.50 set This filmstrip covers the anatomy of the heart, the timing of the heart beat and its control, the heart-lung circulation, composition of the blood, the mechanism of blood clotting, blood types and Rh factor, capillary and venule circulation, and the lymphatic system.	Gr. 10, Biology - ** Science I - **	
2. The Control Of Infectious Organisms * Jam Handy Organization; 1964, 53 fr., color (Biology - Disorders in Humans) 6 f.s., $6.50 each, $36.50 set Types of physical and chemical agents used to destroy pathogens or inhibit their growth--factors that influence the effectiveness of antimicrobial agents--control measures used after infection strikes.		
3. Deficiency Disorders & Disorders Of The Nervous System * Jam Handy Organization, 1964; 53 fr., color (Biology - Disorders in Humans) 6 f.s., $6.50 each, $36.50 set Various types of disorders that can result from an improperly balanced diet--causes, characteristics and treatment of some disorders of the brain and nervous system.		

* Good
** Excellent

II. Living Things - G. (Continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks
4. **The Demand** * EBF 1958; 36 fr., color (Science & Natural Resources Series)3 f.s. In collaboration with Conservation Foundation Discusses the great demand upon the earth which is made by every individual for agricultural products, fuel, metals, and building materials. Explains that citizens of the United States use more resources per year than people in any other country, and points out that the demand increases each year as the population of the world increases.		Also listed II - E
5. **Digestion** * McGraw-Hill Book Co., 40 fr., color (High School Biology Series) 6 f.s., $6.75 each, $36.50 set In the treatment of digestion the following topics are covered: the step-by-step digestion of proteins, carbohydrates and fats in the various organs and their ultimate end products; the absorption of digested food by the villi; the transport of sugars, amino acids and glycerol to the liver and into the general circulation; and, finally, the absorption of fats which enters the lymphatic system and finally also reach the blood stream.	Gr. 10, Biology - ** Science I - **	
6. **Heart Disorders--Cancer--Glandular Disorders** * Jam Handy Organization, 1964; 52 fr., color (Biology - Disorders in Humans) 6 f.s., $6.50 each, $36.50 set Various types of heart disorders, their causes and their treatment--important known facts about cancer--glandular disorders, their causes and treatment.		

* Good
** Excellent

II. Living Things - G. (Continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks
7. How The Nervous System Works * McGraw-Hill Book Co., 40 fr., color (High School Biology Series) 6 f.s., $6.75 each, $36.50 set This filmstrip shows in detail the anatomy and functions of the two main divisions of the nervous system -- the somatic and the autonamic; the structure of a neuron; the transmission of signals across the synapse; types of receptors; the main parts of the brain.	Gr. 10, Biology - ** Science I - **	
8. Our Nervous System ** Heath; 36 fr., color (Human Body) 8A-2, 2 f.s.; 1 f.s. Ecology; 1 f.s. Elec. Energy; 1 f.s. Atomic Structure & Nuclear Energy; 2 f.s. Astronomy; 1 f.s. Geology This filmstrip is a brief review of the human nervous system. It illustrates and locates each of the system's main features, describes its function and gives its correct scientific name.		
9. Respiration ** McGraw-Hill Book Co., 40 fr., color (High School Biology Series) 6 f.s., $6.75 each, $36.50 set This filmstrip considers both external and internal respiration; the mechanism of breathing; the function of hemoglobin; diffusion of oxygen from the capillaries to the tissues and the pick up and transport of CO_2 by the blood to the lungs; the expiration of CO_2 and water vapor; and finally a discussion of the nervous system's control over the rate and depth of breathing.	Gr. 10, Biology - ** Science I - **	

* Good
** Excellent

I. The Earth--Air

A. Definition and/or description of air

Name and Description of Filmstrip	Other Grade Placements	Remarks
1. The Composition of Air ** Jam Handy Organization, 1961; 40 fr., color (Understanding the Atmosphere series, 6 f.s.) $5.75 each The gases which compose air are progressively disclosed and identified. Some of the vital uses of the individual gases in our daily lives are described.	Gr. 4 - *	
2. The Earth's Atmosphere ** Jam Handy Organization, 1961; 37 fr., color (Understanding the Atmosphere series, 6 f.s.) $5.75 each The layers of the atmosphere are clearly and simply visualized. Students can clearly see how the phenomena occurring in each layer present problems in man's effort to travel in the atmosphere and beyond.		

* Good
** Excellent

1. The Earth--Air

B. Economic importance of air

Name and Description of Filmstrip	Other Grade Placements	Remarks
1. Air Works for Man ** Jam Handy Organization, 1961; 34 fr., color (Understanding the Atmosphere series, 6 f.s.) $5.75 each Examples from everyday life illustrate how man utilizes air for the operation of tools such as the vacuum sweeper in the home, the air hammer in industry and other useful equipment.	Grade 4 - **	
2. The Importance of Air in Nature ** Jam Handy Organization, 1961; 37 fr., color (Understanding the Atmosphere series, 6 f.s.) $5.75 each The importance of oxygen, nitrogen, carbon dioxide and water vapor is clearly demonstrated. Logical picture sequences explain oxidation and the ways in which gases of the air are exchanged in nature.	Grade 4 - *	
3. The Physical Characteristics of Air ** Jam Handy Organization, 1961; 40 fr., color (Understanding the Atmosphere series, 6 f.s.) $5.75 each. Visualized demonstrations to show that air will expand and contract, separate and liquefy. The additional characteristics of a gas which air displays are also visually explained.	Gr. 4 - *	
4. What Is Air Pressure? ** Jam Handy Organization, 1961; 44 fr., color (Understanding the Atmosphere series, 6 f.s.) $5.75 each Air pressure is defined by portrayal of the effects of the weight and movement of molecules of air. Example: show how air pressure can be increased and how decreased.	Gr. 4 - *	

* Good
** Excellent

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I. The Earth--Water

C. Economics of the study of water

Name and Description of Filmstrip	Other Grade Placements	Remarks
1. Water For Us **		
Heath; 49 fr., color (Earth - 7A-5) 3 f.s.; 4 f.s. Aerospace; 1 f.s. Heat.		
Americans use tremendous amounts of fresh water. This filmstrip reviews: The ways in which water is used. The sources of our water. Methods for obtaining water. Methods for relieving water shortages.		

* Good
** Excellent

EQUIP. & SUPPLIES

MINNEAPOLIS PUBLIC SCHOOLS
Science Department

INSTRUCTIONS FOR ORDERING AND REPAIR OF SCIENCE EQUIPMENT AND SUPPLIES

Inventory Maintenance

During recent years each of our schools has been bringing their science facilities, equipment and supplies up to a basic minimum for instruction. It now has become necessary that a running inventory of all materials be kept and be completely checked for accuracy each year. It is realized that this requires hard work, but at the same time it is necessary if we are to keep track, prevent duplication and over-ordering of equipment and supplies which are on hand in the classrooms in the many storage facilities. If you do not now have an inventory of your room, we are asking that in the very near future a complete inventory of all equipment and supplies in your science room be made and checked at least once each year. If you desire, the minimum equipment list (copy of which is available in the Science Department Office) may be used as a basis for developing and keeping this inventory.

Procedures for Ordering

A number of difficulties arise each year during the requisitioning, bidding and purchasing of materials for your science classes. We should like to make the following suggestions regarding requisitions for science materials:

1. Confer with your principal as to the amount of money which you may spend on the purchase of science equipment and supplies.

2. All equipment and materials with complete specifications must be requisitioned on Form G-1000. (Please check the typed requisitions for any possible errors).

    a. If it is imperative that certain items be bought from a specific company, group those items on a separate requisition. Give a catalog number and all specifications for each item. (i.e. Grass frogs, preserved, 1-3/4" to 2-1/2" body length).

    b. On all other requisitioned items, please give your preferred company's catalog number. Be sure to include all specifications. (i.e. Microscope slide cover, glass, 22 mm. square, #1 thickness). It is permissible in your requisition for these items to specify, "similar to Cenco No. 19474" or "quality equal or better than Walker No. 4-686". When our purchasing department submits your requisitioned items with all specifications for bids, some money can be saved and you will still get the quality of materials which you desire.

    c. It is suggested that you list all live specimens and cultures on a separate requisition. Future dates for delivery should be indicated, if possible. If date of delivery cannot be determined when the requisition is made, mark requisition, "To be delivered on demand by the instructor".

INSTRUCTIONS FOR ORDERING AND REPAIR OF SCIENCE EQUIPMENT AND SUPPLIES (cont.)

3. Use the most recent catalog and price list for all requisitioned items. Prices are increasing all the time. Be sure to allow for some possible price increases when requisitioning. (May we suggest that you put the least needed items at the bottom of the requisition and indicate which ones may be dropped from your order if your science allotment does not cover all items, due to price increases?) The prices which we receive on bids are the only guaranteed prices--catalog prices are not guaranteed prices! Most scientific supply companies tell us that they cannot furnish a new catalog to each teacher. When the Science Office receives a new catalog for your school, we send it to your librarian.

4. The list of scientific equipment and supply companies and their respective representatives is for your use. Please keep it for your future reference. If you receive materials from any company which do not meet your specifications as included on your requisition, it is your responsibility as the science instructor to immediately contact the company or its representative and see that the Minneapolis Public Schools secure value received from the equipment companies.

If we can be of any assistance in locating science equipment or supplies which you need in instruction, do not hesitate to call upon us for assistance.

Procedures if New Equipment or Supplies Arrive Damaged:

When newly ordered equipment or supplies arrive in a damaged condition,
(1) the public carrier (usually the Post Office or the Railway Express) should be informed immediately of such damage. In most cases they will send one of their men to examine the carton and damaged equipment. It will be necessary for you to work with your requisition clerk to see that this is carried out. Following this examination by the public carrier you should,

(2) inform the scientific supply company from whom you have purchased this material that it was damaged in transit and you desire replacements. This cannot be done by the clerks in the Central Office as they do not understand the conditions that exist in your school building. Please have your building requisition clerk do this letter writing for you.

It is necessary that you, as the classroom science instructor, see that our Board of Education secures value received and equipment which is ordered and paid for. May we ask your assistance in carrying out both of these steps as indicated above?

Procedures for Repair of Equipment

As equipment is used in the teaching of science, it eventually wears out or may become unavoidably damaged. When a piece of equipment is no longer usable for science instruction, it should be repaired and returned to service or be removed from your inventory and the Board of Education inventory kept in the Finance Department. If you desire any assistance regarding decisions to repair equipment or remove it from inventory, do not hesitate to call upon the Science Department Office for suggestions.

INSTRUCTIONS FOR ORDERING AND REPAIR OF SCIENCE EQUIPMENT AND SUPPLIES (cont.)

If you believe a specific piece of equipment can be repaired, you should carry out the following steps in cooperation with your requisition clerk:

1. Write a letter to the manufacturer or supplier of the equipment requesting directions for shipment of the equipment to them for possible repair. Be sure to instruct them in the letter that upon receipt of the equipment, they are to examine the equipment and then send you a firm bid for the price of the repairs. Warn them that they are not to repair the equipment until they have received a "purchase order" for the work. When you receive the letter of firm bid and shipping instructions from the manufacturer, ship the equipment as directed and proceed with the next step.

2. When you receive the firm bid and you feel that the estimated cost of repair is within reason, you should have a request for repair filled out on the regular requisition blank, form G-1000, and fasten the firm bid letter to it. Forward this requisition to the Board of Education Business Office and they will follow through on sending the purchase order to the manufacturer. If you feel that the cost of repair is too great, request the manufacturer or supplier to return the equipment to you. Before you dispose of the equipment contact the Science Department Office for advice.

3. When the equipment has been repaired and returned to you in satisfactory condition, sign the blue copy of the purchase order which your requisition clerk has in her files. Have this blue copy forwarded to the Board of Education Business Office for payment.

Many pieces of science equipment can be repaired locally such as compound microscopes and aquariums. If the Science Department Office can be of assistance to you in locating sources of repair, do not hesitate to call them.

Audio visual equipment needing repairs should be referred to the building audio-visual coordinator.

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5-14-63
Revised 12-14-65

EQUIPMENT AND SUPPLIES FOR SEVENTH, EIGHTH AND NINTH GRADE SCIENCE

commended nimum tity -- ol	Room	Equipment Description	* Unit Cost	On Hand Inventory	To Be Ordered
1		Air pump, with pump plate (23 cm in diam.), vacuum and pressure with motor, 115 volts AC, Cenco 90515-1	140.00		
1		Barometer, mercurial, 0-4000 ft., Cenco 76890	60.00		
1		Bell Jar, 15" x 8-3/4", Cenco 14302-3	28.25		
3		Bins, 16" x 16" x 23½", mobile, metal lined, Sheldon T3170	70.00		
	1	[redacted]	[redacted]		
1		Pump Plate, with guard plug, 27 cm diam., Cenco 94205 (not needed with Cenco 90515-1)	41.00		
1		S.V.E. Microbeam Attachment, Trans-Mississippi Biological Supply Co.	54.50		

Unit Cost as of January 1961.

Equipment and Supplies for Seventh, Eighth and Ninth Grade Science

Recommended Minimum Quantity --		Geology Equipment and Supplies Description	* Unit Cost	On Hand Inventory	To Be Ordered
School	Room				
1		Teacher's Mineral Set (3" size) Consist of the following: Hematite, Kaolinite, Limonite, Quartz, Siderite, Taconite, Apatite, Asbestos, Azurite, Bauxite, Calcite, Carnotite, Chalcopyrite, Onyx, Corrundum, Diamond, Flucrite, Garnet in Schist, Graphite, Gypsum, Halite (rock salt), Manganese, Marble, Mica (Biotite), Native copper, Obsidian, Opalite, Orthoclase, Pyrite, Pyrrhotite, Schoolite, Shale (Sylvite). Sphalerite, Sulfur, Talc, Topaz, Tourmaline, Willemite, Basalt, Conglomerate, Dolomite, Gneiss, Granite, Limestone, Peat, Sandstone, Schist, Shale, Slate, Marble, Quartzite, Soapstone, Magnetite.	60.00		
	1	Student's collection, (2" size), are as follows: Hematite, Kaolinite, Limonite, Magnetite, Quartz, Asbestos, Bauxite, Carnotite, Calcopyrite, Fluorite, Galena, Graphite, Halite, Mica (Biotite, Native copper, Pyrite, Quartz (Jasper)	8.00		
	36	Bag of 36 unknown minerals for student laboratory practice	2.90		

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*Unit Cost as of January 1961

commended nimum ntity --		Equipment (charts and models) Description	* Unit Cost	On Hand Inventory	To Be Ordered	
ol	Room					
1		Collection of Beneficial Insects, comparable teaching collection, General Biological Supply House (Turtox) 9D814	31.00			
1		Collection of Harmful Insects, comparable teaching collection, General Biological Supply House (Turtox) 9D813	31.00			
1		Universal Planetarium, simplified, (Universal Products), Lystrom	29.50			

Unit Cost as of January 1961.

mmended mum ntity -- 51	Room	Supplies (permanent) Description	* Unit Cost	On Hand Inventory	To Be Ordered	
		AC Armature (to use on Cenco 79945 St. Louis motor), Cenco 79949	4.50			
	1	Ammeter, AC, panel mount, 0-10 amps., model RF-2C, Allied Radio 67F649	2.94			
	1	Ammeter, DC, panel mount, 30-0-30 amps., model RF-2C, Allied Radio 67F659	1.81			
	6	Animal Cage , round form, 3 mesh, 18 gauge, wire cloth, galvanized after weaving, 8½" dia., 9" high, with pan 1½" deep, Walker 1-270	8.10			
	6	Animal Cage , Army Medical School Model, wire cloth, 3 mesh, 18 gauge, galvanized, 9" wide x 9" high x 15" long, Walker 1-260 or Cenco 44042	15.60 13.00			
	1	Apron, laboratory, polyvinyl, light weight, 29" x 35", Cenco 10096	.95			
	2	Aquarium, steel frame, 18" x 10" x 9½", 6 gal., Bd. of Ed., Educational Supplies, Code 224	8.00			
	1	Aquarium Air Pump, "Oscar Jr." #55, Trans-Mississippi Biological Supply #384	6.20			
	1	Aquarium, brass valve , 3 way (1 intake, 2 outlets), Trans-Mississippi Biological Supply	.20			
		Aquarium Glass Cleaner, Welch 8340E	1.00			
	1	Aquarium Heater, thermostat, 50 watt, 8" long thermostat, Cenco 57142-1	6.25			
	1	Aquarium Net, frame 3" wide, bag 3½" deep, Cenco 57220	.35			
	1	Aquarium Sub-sand Filter, Trans-Mississippi Biological Supply #175	2.75			
	6	Attachment Plug Base, Bd. of Ed., Educational Supplies	.039			
	1	Balance, dial spring, 500 gram in 5 gm divisions and 18 ounce in 1/4 oz. divisions, Welch 4078	2.65			
	1	Balance, dial spring, 2000 gram in 10 gm divisions and 72 ounce in 1/2 oz. divisions, Welch 4079	2.65			
	1	Balance, Harvard trip, with stainless steel pans, double beam, metric, 210 gm beam capacity Walker 3-434	24.00			

nit Cost as of January 1961.

uipment and Supplies for Seventh, Eighth and Ninth Grade Science

ommended nimum ntity --		Supplies (permanent) Description	* Unit Cost	On Hand Inventory	To Be Ordered	
ol	Room					
	1	Ball and Ring Apparatus, brass with hardwood handles, Cenco 77450	4.15			
	1	Barometer, aneroid, dial type, Bd. of Ed., Educational Supplies	3.53			
	2	Battery Jars, 4" x 5", 2 pint capacity, Cenco 15200-2	.73			
	2	Battery Jars, 6½" x 8", 8 pint capacity, Cenco 15200-4	1.46			
	1	Beehive Support, heavy zinc, 13½" dia. x 1-5/8" high, 3/4" hole, Cenco 15580	2.25			
	1	Bell, electric, AC or DC, 1½-3 volts required, Cenco 84010-1	1.65			
1		Bell Jar, open top, 7/8" hole, 10" x 6", Cenco 14305-2	17.50			
	24	Binding Post, Spring, Fahnenstock patent, single, Cenco 83825-2	.14			
	24	Binding Post, Spring, Fahnenstock patent, double, Cenco 83825-3	.21			
	1	Blowpipe, brass, 8", Cenco 10260	.45			
	1	#419 Bottle, "Acid Hydrochloric, Concentrated," Cenco 10790	.60			
	1	#422 Bottle, "Acid Nitric, Concentrated," Cenco 10790	.60			
	1	#420 Bottle, "Acid Sulfuric, Concentrated," Cenco 10790	.60			
	1	#15 Bottle, "Ammonium Hydroxide," Cenco 10790	.60			
	1	#26 Bottle, "Silver Nitrate" (amber), Cenco 10790	.60			
	6	Brass Keyless Socket, Bd. of Ed., Maintenance Supplies	.162			
	2	Broom, whisk, Bd. of Ed., Educational Supplies	.49			

Unit Cost as of January 1961

ommended imum ntity ol	Room	Supplies (permanent) Description	* Unit Cost	On Hand Inventory	To Be Ordered	
	2	Brush , bench, 9", Bd. of Ed., Educational Supplies	1.73			
	3	Brush , test tube, natural bristles, ½"-5/8", Cenco 10968-2	.13			
	3	Brush , test tube, natural bristles, 3/4"-1", Cenco 10968-3	.17			
	12	Burner, Bunsen, H-base, for natural gas, ½", Cenco 11002-3	1.55			
	1	Burner, high temp., H-base, for natural gas, Cenco 11017-3	2.70			
	3	Burner, wing top, to fit ½" dia. burner tube, Cenco 11205-2	.36			
	1	Buzzer, electric, AC or DC, Cenco 84020	1.75			
	1	Capillary Tubes, set of 7 in support, Stansi 1040	1.95			
	1	Capillary Tubes, set of 7 without support, replacements, Stansi 1025	.75			
	1	Cartesian Diver Set, with 8" x 1½" jar and rubber diaphragm, Cenco 76067	2.15			
1		Case for use with Cenco 76890 mercurial barometer, Cenco 76892	7.75			
	1	Cat Skin (half skin), 20 x 20 cm, Cenco 78640	3.70			
	1	Cell, Student's Demonstration, complete with glass jar, porcelain cup, porous cup, and 10 elements, Cenco 79280	4.90			
	1	Chart of the Atoms, latest edition, formed-metal chart molding top and bottom, eyelets, Welch 4854	7.50			
	1	Chart, Metric, 27" x 44", metal edging, 2 hangers, Welch 149	5.45			
1		Chick Development Stages, bioplastic mount, Ward Pz6492	10.50			

it Cost as of January 1961.

Recommended Minimum Quantity -- School	Room	Supplies (permanent) Description	* Unit Cost	On Hand Inventory	To Be Ordered
	4	Clamp, Burette, 6" x 1½", symmetrical, screw clamp type, Cenco 12102	1.65		
	2	Clamp, Day's, spring pinchcock for tubing up to 3/8", Cenco 12180	.15		
	12	[illegible]mp, Test Tube, Stoddard's, Cenco 12155	.13		
1	1	Cloths Moth, Life History, Riker mount, General Biological Supply House (Turtox) 9D648	6.75		
	1	Color Disks, 8.5 cm. dia., adjustable, with electric motor, to be run on 2 or 3 dry cells, Welch 2486	22.50		
1		Common Igneous Rocks, Wrights XCC1	14.95		
1		Common Metamorphic Rocks, Wrights XCC3	14.95		
1		Common Sedimentary Rocks, Wrights XCC2	14.95		
	1	Compound Bar, invar steel and brass with hardwood handle, 25 cm long, Cenco 77455	1.30		
	1	Condenser, Liebig, stopper assembly, lime glass, 400 mm jacket, 625 mm long, Cenco 14455-2	2.40		
	2 pkg.	Connector Tip, Universal (12 to pkg.), Cenco 83900	.95		
	1	Convection Apparatus, Gases, metal with glass wall and 2 glass chimneys, Cenco 77590	7.50		
1		Cork Borer, set of 6 (3/16" to ½"), brass, Cenco 12465-2	2.65		
1		Cork Borer Sharpener, sharpens from 3/16" to 1", Cenco 12485	4.20		
	2 pkg.	Corks, XXXX quality, assorted sizes 1 to 11 (100 to pkg.), Cenco 12422	2.25		
	1 pkg.	Corks, XXXX quality, assorted sizes 3 to 16 (100 to pkg.), Cenco 12424	3.75		
	1 pkg.	Corks, XXXX quality, assorted sizes 12 to 26 (100 to pkg.), Cenco 12406	6.30		

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* Unit Cost as of January 1961.

Equipment and Supplies for Seventh, Eighth and Ninth Grade Science

Recommended Minimum Quantity --		Supplies (permanent)	*		
School	Room	Description	Unit Cost	On Hand Inventory	To Be Ordered
	1 pkg.	Darning Needles (10 to pkg.), 7.5 cm long, Cenco 78360	.25		
	1	Deflagrating Spoon, stainless steel, 3/4" dia., 15" long, Cenco 12662	.47		
	1	Demonstration Balance, meter stick type, knife edge clamp and heavy iron support, Cenco 75560	2.60		
	1	Dissecting Set, single-fold leatherette case, with scalpel, forceps, scissors, 2 needles and 6" ruler, Cenco 53004	2.80		
	1	Electrolysis Apparatus, Brownlee form, platinum electrodes, with 2 test tubes, without jar, Cenco 81185	5.75		
	1	Electromagnet, horseshoe type, with 3 brass wire connectors, 11.5 cm long, Cenco 79640	11.50		
1		Electromagnet Attachment (to use on Cenco 79945 St. Louis Motor), Cenco 79947	6.15		
	1	Exciting Pad, silk, 20 x 25 cm, Cenco 78635	.50		
	1	Exciting Pad, wool felt, 20 x 30 cm, Cenco 78630	.60		
	1	Filter Pump and Hose Nipple, brass and monel metal, with plug, Cenco 13195	1.65		
	1	Fire Blanket, wool, 62" x 84" (request through principal), Bd. of Ed., Equipment	3.91		
	3	Fire Extinguisher, carbon dioxide, 5 lb., (request through principal), Bd. of Ed., Equipment	15.00		
	1	First Aid Cabinet (request through principal), Bd. of Ed., Equipment	5.19		
	1	Force Pump, working plastic model, with pressure-equalizing air chamber, cylinder 1-3/4" dia., Welch 1107	5.65		
	3	Forceps, chemical, steel, 125 mm, Cenco 13480	.26		
	1	Forceps, straight, fine point, 110 mm length, nickel plated steel, Cenco 53112	.30		

Unit Cost as of January 1961.

Equipment and Supplies for Seventh, Eighth and Ninth Grade Science

Recommended Minimum Quantity -- School	Room	Supplies (permanent) Description	* Unit Cost	On Hand Inventory	To Be Ordered
	1	Friction Rod, hard rubber, one end tapered, 25 cm long by 13 mm dia., Cenco 78620	.70		
	1	Friction Rod, solid glass, one end blunt and ground to midpoint, 30 cm long by 13 mm dia., Cenco 78605	1.10		
1		Frog Metamorphosis, bioplastic mount, Ward Pz6204	9.50		
	1	Gyroscope, simple form, 5.5 cm dia. wheel, 6.5 cm support rod on iron base, Cenco 74780	2.35		
1		Honey Bee (Apis Mellifica), Life History, Riker mount, General Biological Supply House (Turtox) 9D677	8.50		
25 ft.		Hose, Garden, 5/8" (with couplings), Bd. of Ed., Maintenance Supplies	.13		
	1	Hot Plate, electric, cast aluminum, Temco, 660 watts, Walker 42-834	27.50		
		or 550 watts, Cenco 16630	22.75		
	1	Hygrometer, Stewart, Humidiguide, Taylor, range of temp. 40°-116°F., Cenco 76990	8.10		
	1	Inclined Plane Board with pulley, without accessories, Cenco 75845	5.00		
	1	Insect Net, nylon , General Biological Supply House (Turtox) 105 All-N	4.85		
	1	Jack Model Screw, base 32 mm dia., range 57-92 mm, Cenco 75800	4.20		
	1 pkg.	Knitting Needles (12 to pkg.), steel, Cenco 78365	.55		
	1	Lens, double concave, 3.75 cm dia., 10 cm focus, Cenco 85650-1	.90		
	1	Lens, double convex , 3.75 cm dia., 10 cm focus, Cenco 85645-2	.65		
1		Lenses, Demonstration Set, six types, 5.0 cm dia., Cenco 85680	8.25		

* Unit Cost as of January 1961.

imum ntity ool	Room	Supplies (permanent) Description	* Unit Cost	On Hand Inventory	To Be Ordered
	5	Lever Holder, to fit standard meter stick, knife edges, loop for suspension, with set screw, Cenco 75555	1.15		
	3	Library Filmstrip Film Case ([illegible]) [illegible] Film & Radio Co., Inc., Richmond, Virginia	1.25		
	1	Lift Pump, working plastic model, cylinder 1-3/4" dia., Welch 1106	4.95		
	3 pr.	Magnets, Bar, steel, in wood box with keeper, 6 mm x 19 mm x 15 cm, Cenco 78280	1.80		
	12	Magnetic Compass, 10 mm dia., mounted in brass case, Cenco 78430-1	.20		
	12	Magnetic Compass, 45 mm dia., mounted in brass case with ring, Cenco 78430-4	.85		
	1 pr.	Magnet, Cylindrical, Alnico, 180 mm long by 15 mm dia., Cenco 78291-3	5.60		
	1	Magnet, Floating, 50 mm long by 4.5 mm dia., mounted in plastic support, Cenco 78300	3.25		
	1	Magnet, Horseshoe, Alnico, with keeper, 28 x 29 mm, pole separation 8 mm, Cenco 78326-1	.92		
	1	Magnet, Natural (lodestone), Cenco 78250	.18		
	1	Magnetic Needle, brass bearing, mounted on steel pivot, Cenco 78415	2.45		
	1	Magnetic Needle, dipping, mounted on horizontal pivot, in brass frame, graduated arc, Cenco 78425	13.25		
1		Magneto Electric Generator, on 12.5 x 25 cm hardwood base, with mounted Edison socket and incandescent lamp, Cenco 79895	22.25		
	1	Magnifier, Reading Glass, round, 2½" lens dia., Cenco 60410-2	1.70		
36		Magnifier, Tripod, aperture 20 mm, 10X magnification, Cenco 60020	1.10		

* Unit Cost as of January 1961.

mended imum tity -- ol	Room	Supplies (permanent) Description	Unit Cost	On Hand Inventory	To Be Ordered
	1	Metal Case for Fire Blanket, Bd. of Ed., Equipment, Code 1087	4.25		
	1	Meter Stick, maple, 2 cm square, faces with 1 m, 1/10 m, 1/100 m, and 1/1000 m graduations, Cenco 73105	8.25		
	6	Meter Stick, maple, English graduated into inches and eighths; metric graduated into dm, cm, mm; Cenco 73115	.85		
	1 pkg.	Micromount Cards (100 to pkg.), no glass, General Science Service Co.	2.50		
1		Microphone, Demonstration, Stansi 4890	3.50		
	4	Microscope, M-110, 50X and 100X magnifications, with illuminator above and below, plus 12 prepared slides, General Sci. Service Co.	17.50		
1		Minerals in Moh's Scale of Hardness, 9 specimens, Cenco 52648	3.30		
	2	Mirror, spherical, concave and convex, 75 mm dia., 20 cm focus, Cenco 85425	1.00		
1		Mirror, spherical, concave, demonstration type, 16" dia., 37 cm focus, Cenco 85407	10.00		
1		Mirror, spherical, convex, demonstration type, 16" dia., 37 cm focus, Cenco 85417	10.00		
1		Monarch Butterfly (Danaus Archippus), Life History, Riker mount, Turtox 98505	7.00		
1		Motor, St. Louis, with 2 bar magnets, 2 pole DC armature, without other accessories, Cenco 79945	11.50		
1		Order of Insects, Riker mount, Turtox 98811	8.50		
	1	Pail, galvanized, 12 qts., Bd. of Ed., Educational Supplies	.86		
	1	(Pulse or) Palm Glass, Franklin's, 18 cm long, Cenco 77730	2.60		
	2	Pan with Holder, for model pump, 9½" x 5½", rust-resistant finish, Welch 1109	2.75		
		Pulse (or Palm) Glass, Franklin's, 18 cm long, Cenco 77730	[illegible]		

mmended mum ity --		Supplies (permanent) Description	* Unit Cost	On Hand Inventory	To Be Ordered	
ol	Room					
	1 pkg.	Pith Balls, suspension type, with silk cord, (pkg. of 6), Cenco 78650-1	2.35			
	5	Plug, rubber handle grip, "spring action," Cenco 84145	.18			
		Power Supply Unit, AC-DC, up to 5.3 volts DC and 11 volts AC, Cenco 79548	22.00			
	1	Prism, Equilateral, flint glass, 28 mm face x 75 mm length, Cenco 85505-1	2.30			
	1	Prism, Right Angle, flint glass, angles 45° and 90°, widest face 32 mm, 50 mm long, Cenco 85520	2.10			
	3	Pulley , Single Sheave, bakelite, grooved sheave 2" dia., hook links top and bottom, Cenco 75625	.80			
	2	Pulleys, Double Tandem, bakelite, grooved sheaves 2" and 1½" dia., hooks top and bottom, Cenco 75644	1.55			
	2	Pulleys, Triple Tandem, bakelite; grooved sheaves 2", 1½", and 1" dia.; hooks top and bottom, Cenco 75646	2.05			
	1	Push Button, pressed metal, 2¼" dia., Cenco 84040	.42			
	1	Radiometer, Crookes, rotating shaft with 4 vanes in light glass bulb, bakelite base, Cenco 77640	3.00			
		Rain Gauge, zinc vessel 3" dia. by 13", copper cup 3" dia., brass tube 1" graduated to 0.01" readings, Cenco 77025	14.00			
	1	Right Angle Clamp, aluminum alloy, thumb screw, for rod ½" dia., Cenco 12241-1	1.10			
	2	Riker Mount , standard size F, Turtox 100A56	2.20			
	6	Ring, Iron, with clamp, 4" inside dia., Cenco 18005-3	1.05			
	6	Ring, Iron, with clamp, 5" inside dia., Cenco 18005-4	1.15			

it Cost as of January 1961.

ecommended inimum antity -- chool	Room	Supplies (permanent) Description	* Unit Cost	On Hand Inventory	To Be Ordered
1		Rock Cycle, Wrights XCC4	10.95		
	1 lb.	Rubber Stoppers, assorted sizes 2 to 6, Cenco 18153-1	1.25		
	35 ft.	Rubber Tubing, red medium wall, 1/4" inside dia. by 1/16" wall, Cenco 18200-3	.30 /ft.		
	10 ft.	Rubber Tubing, red medium wall, 3/16" inside dia. by 1/16" wall, Cenco 18200-2	.27 /ft.		
	5 ft.	Rubber Tubing, red extra heavy wall, ¼" inside dia., Cenco 18204-3	.52 /ft.		
	6	Scissors, 6", Bd. of Ed., Educational Supplies, Code 224	1.94		
	1	Soft Iron Rod, 15 cm x 13 mm, Welch 1805	.25		
1		Spray Gun, Hudson #433A, 1 qt., Bd. of Ed., Maintenance Supplies	1.59		
1		Spring Balance, demonstration, Sutton, 20 cm dial, graduated 0-22 (100-2200 gm) in half unit divisions, Welch 4075	6.00		
1		Spotlight Pointer, battery operated, with incandescent lamp and 2 batteries, Cenco 56115	9.55		
	2	Spreading Board, adjustable, 5-3/4" x 12-7/8", groove adjustable from 1/8" to 3/4", Cenco 54184	3.75		
	12	Support, iron, rectangular base, 4-7/8" x 8", 20" rod with 3/8" dia., Cenco 19070-2	1.90		
	3	Support, Test Tube, hardwood, 10 tubes, with drying pins, Cenco 19190	1.65		
	2	Switch, Knife, single pole, single throw, porcelain base (25 amp), Cenco 84315	.40		
1		Telephone Receiver, Stansi 4875	2.50		
1		Telephone Transmitter, demonstration form, Cenco 80800	4.90		
	1	Test Tube Basket, stainless steel wire, rectangular, 6" x 6¼" x 6¼", Cenco 48521-2	6.00		

Unit Cost as of January 1961.

mmended mum tity –		Supplies (permanent)	*	On Hand	To Be
ol	Room	Description	Unit Cost	Inventory	Ordered
	2	Tongs, Crucible, parkerized steel, double bent, Cenco 19630	.38		
	2	Triangle , round chromel, $1\frac{1}{2}$" side, Cenco 19705-2	.26		
	1	Trough , glass, pneumatic, $11\frac{1}{2}$" x 8" x 8", Cenco 15575-3	12.75		
		Trowel , collecting and transplanting, 6" steel blade, hardwood handle, Cenco 50440	.70		
	1	Tuning Fork, unmounted, non-tarnishing alloy, C', 256 V.P.S., Cenco 84560-3	5.50		
	1	Tuning Fork, unmounted, non-tarnishing alloy, C", 512 V.P.S., Cenco 84560-11	5.00		
		Universal Sun Dial, 25 cm dia., with instructions, Welch 840	7.50		
	1	Voltmeter, AC, panel mount, 0-150 volts, model RF-2C, Allied Radio 67F671	3.53		
	1	Voltmeter, DC, panel mount, 0-10 volts, model RF-2C, Allied Radio 67F637	1.81		
	4	Weather Forecasting Computer, 4" x 4", with instructions, Welch 1253	.25		
	1	Weather Thermometer, Fahrenheit, maximum and minimum, bimetallic dial type, knob reset, Taylor 5321 or Cenco 19474	7.65		
	1 set	Weights, in block, 1 gm to 1000 gm, Class C, Cenco 9125-4	13.50		
		Weights, avoir., lb. and oz., Class II, Cenco 8960-1	16.00		
	1 set	Weights, hooked, in block, 10 gm to 1 kg, Cenco 9810	14.25		
	1	Wheel and Axle, aluminum, grooved wheels; 12, 8, 4, and 2 cm dia.; 13 mm rod without clamp, Cenco 75746	5.70		

it Cost as of January 1961.

commended nimum ntity hool	Room	Supplies (permanent) Description	Unit Cost	On Hand Inventory	To Be Ordered	
	6	Wire Gauze, galvanized iron, 16 mesh, 5" x 5", Cenco 19965-2	.22			
	[illegible]	Wire Gauze, galvanized iron, asbestos center, 5" x 5", Cenco 19970-2	.26			

nit Cost as of January 1961.

ommended imum ntity --		Supplies (Tools) Description	* Unit Cost	On Hand Inventory	To Be Ordered
ool	Room				
	1	Bit, auger, square shank, ¼", #4, Bd. of Ed., Educational Supplies	.95		
	1	Bit, auger, square shank, 5/16", #5, Bd. of Ed., Educational Supplies	.95		
	1	Bit, auger, square shank, 3/8", #6, Bd. of Ed., Educational Supplies	1.00		
	1	Bit, auger, square shank, 7/16", #7, Bd. of Ed., Educational Supplies	1.09		
	1	Bit, auger, square shank, ½", #8, Bd. of Ed., Educational Supplies	1.18		
	12	Blade, coping saw, 6½" (Disston #25), Bd. of Ed., Educational Supplies	.02		
	6	Blade, hack saw, 10", 24 teeth, Bd. of Ed., Educational Supplies	.10		
	1	Brace, auger bit, square shank, ratchet, 10" sweep, #945, Bd. of Ed., Educational Supplies	4.55		
	2	File, triangular, 4", Cat. No. 88325, Bd. of Ed., Educational Supplies	.34		
	1	Glass Cutter, steel wheel, "Red Devil," Bd. of Ed., Maintenance Supplies	.24		
1		Gauge, sheet metal, Starrett #283, Bd. of Ed., Educational Supplies	5.39		
1		Gauge, wire, Starrett #188, Bd. of Ed., Educational Supplies	5.05		
	1	Hammer, claw, 10 oz., Stanley #52½, Bd. of Ed., Educational Supplies	2.33		
	3	Knife, sloyd, Murphy #0, Bd. of Ed., Educational Supplies	.49		
	2	Plane, Jack, Stanley #5, Bd. of Ed., Educational Supplies	6.25		
	1	Plier, combination, adjustable, 6" long, tool steel, Cenco 88525	.85		
	1	Plier, long nosed, side cutting 5½" long, 1-3/4" jaws, Cenco 88517	1.81		

nit Cost as of January 1961.

ommended imum ntity -- ool Room	Supplies (Tools) Description	* Unit Cost	On Hand Inventory	To Be Ordered
1	Push Drill, Yankee, Warner Hardware	5.95		
3	Saws, coping, 6½", Disston #25, Bd. of Ed., Educational Supplies	.34		
1	Saws, cross cut, 20", 10 point, Atkins #51, Bd. of Ed., Educational Supplies	3.82		
1	Saws, hack, pistol grip, #1237, Bd. of Ed., Educational Supplies	1.41		
1	Screw Driver, 1½" blade, 1/8" point, #21, Bd. of Ed., Educational Supplies	.50		
1	Screw Driver, 3" blade, 3/16" point, #20, Bd. of Ed., Educational Supplies	.39		
1	Screw Driver, 6" blade, 5/16" point, Bd. of Ed., Educational Supplies	.52		
1	Screw Driver, Phillips head, 3½" x ¼" blade, size 2 head, Bd. of Ed., Educational Supplies	.35		
1	Snips, tinner's, 1½", Wiss #13, Bd. of Ed., Educational Supplies	1.20		
1	Soldering Gun Kit, dual heat (90 or 125 watt), Weller, model 8200K, Warner Hardware	7.95		
2	Vise, wood and metal, 3" jaw, diamond-simplex, utility, Warner Hareware #300	6.67		

t Cost as of January 1961.

commended inimum uantity		Supplies (Temporary) Description	* Unit Cost	On Hand Inventory	To Be Ordered
chool	Room				
	1	Barometer Tube, plain, 86 cm long, Cenco 76820	1.00		
	4	Beaker, Pyrex, 250 ml, low form with lip, Cenco 14265	.39		
	4	Beaker, Pyrex, 400 ml, low form with lip, Cenco 14265	.46		
	12	Bottle, flint glass, wide mouth, 8 oz., Cenco 10320	.075		
	12	Bottle, flint glass, wide mouth, 16 oz., Cenco 1032	.11		
	2	Crucible, Coors, low form, 12 ml capacity, porcelain, 37 mm dia., 21 mm high, Cenco 18540-2	.38		
	12	Culture Dish, Petri, Pyrex, 100 mm dia. upper dish, 15 mm height of lower dish, Cenco 44370-4	.60		
	1	Cylinder, double graduated, 100 ml, 1 ml divisions, Cenco 16105	1.55		
	2	Dish, Evaporating, porcelain, Coors, 75 mm dia., Cenco 18575-00A	.47		
	4	Flask, Boiling or Florence, Pyrex, flat bottom, 250 ml, Cenco 14805	.78		
	2	Flask, Boiling or Florence, Pyrex, flat bottom, 500 ml, Cenco 14805	1.00		
	5	Flask, Erlenmeyer, Pyrex, 250 ml, for rubber stopper No. 6, Cenco 14905	.51		
	4	Flask, Erlenmeyer, Pyrex, 500 ml, for rubber stopper No. 7, Cenco 14905	.61		
	2	Funnel, Chemical, Kimble, 75 mm short stem, Cenco 15052	1.00		
	2	Funnel, Chemical, Kimble, 100 mm short stem, Cenco 15052	1.40		
	1 pkg.	Glass Plates, clear, 75 x 75 mm (12 to pkg.), Cenco 17730-2	.50		
	2 lb.	Glass Rod, 6 mm, Cenco 14050	.95 /lb.		
	5 lb.	Glass Tubing, 6 mm, Cenco 14076	.95 /lb.		

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* Unit Cost as of January 1961

ommended ntity	Room	Supplies (Temporary) Description	* Unit Cost	On Hand Inventory	To Be Ordered
	36	Magnifier, small, 3-5/8" long, fitted with two spherical convex lenses (3X and 7X) and two cylindrical magnifiers, all plastic, Bd. of Ed., Educational Supplies	.30		
	2 pkg.	Medicine Droppers, straight (12 to pkg.), Cenco 15302	.46		
	1 box	Microscope Slides, non-corrosive laboratory grade, 75 x 25 mm (72 to box), Cenco 66310	1.50		
	1 box	Microscope Slide Cover Glasses, student grade, 18 mm square, No. 2, Cenco 66535-2	1.50		
	1	Mortar and Pestle, 100 mm dia., Cenco 17381	1.66		
0		Pot, clay, plant, 2½", Red Wing Pottery	.04		
0		Pot, clay, plant, 3", Red Wing Pottery	.05		
50		Pot, clay, plant, 4", Red Wing Pottery	.10		
0		Pot, clay, plant, 5", Red Wing Pottery	.15		
		Pot, clay, plant, 6", Red Wing Pottery	.20		
0		Pot, clay, plant, 8", Red Wing Pottery	.50		
00		Pots, paper, plant, Vitagreen, 2½" ($1.40 per 100) Danish Seed Co.	8.60 /1000		
	36	Receptacle, miniature, porcelain (for Cenco 84420 lamps), Cenco 94165	.25		
	72	Test Tube, Pyrex, with rim, 150 x 20 mm, Cenco 15785-7	.098		
	24	Test Tube, Pyrex, with rim, 200 x 25 mm, Cenco 15785-10	.174		
	1	Thermometer, double scale, centigrade and Fahrenheit, laboratory grade, engraved stem, -20° to 110°C in 1° division and 0° to 230°F in 2° divisions, Cenco 19325-1	2.70		
	2	Thermometer, laboratory grade, etched scale, yellow backed, -10° to 110°C with 1° divisions, Cenco 19242-1	2.20		

nit Cost as of January 1961.

ecommended inimum ntity -- chool Room	Supplies (Temporary) Description	* Unit Cost	On Hand Inventory	To Be Ordered
6	Tube , Funnel, thistle top, 14" stem, Cenco 15706-2	.64		
36	Vial , Shell, #2, 7 ml capacity, 15 x 75 mm, Cenco 10700-2	.043		
36	Vial , Shell, #7, 30 ml capacity, 25 x 95 mm, Cenco 10700-7	.097		
12	Watch Glass , Pyrex, 75 mm, Cenco 15850	.15		

* Unit Cost as of January 1961.

Recommended Minimum Quantity -- School	Room	Supplies (Chemicals) Description	* Unit Cost	On Hand Inventory	To Be Ordered
1 lb.		Acid, Hydrochloric (muriatic acid), Tech. (available in 1 gal. bottle at $1.85)	.89		
[illegible]		Acid, Nitric, Tech. (available in 1 gal. bottles at $4.00)	2.13		
1 lb.		Acid, Sulfuric, Tech. (available in 1 gal. bottles only at $1.85)	.95		
1 lb.		Agar Agar Flakes, Difco, flake (¼ lb. available at $3.15)	8.95		
4 oz.		Agar, Nutrient, Standard, Difco	3.50		
1 qt.		Alcohol-Ethyl, Denatured (Synasol) (1 gal. available at $1.16)	.34		
1 lb.		Alum (aluminum potassium sulfate)	.59		
	1 sq ft.	Aluminum Sheet, #20 B & S, Cenco 89005-20	1.25		
1 lb.		Ammonium Hydroxide, Tech. (available in 1 gal. bottle at $1.50)	.56		
4 oz.		Beef Extract, Difco B126	4.20		
	4 oz	Benedict's Solution (available in 8 oz. bottle only at $1.70 - or can be purchased at drugstore)	.85		
1 lb.		Calcium Carbonate (marble chips), Tech.	.50		
1 lb.		Calcium Chloride, Tech., anhy. 8 mesh	1.09		
1 lb.		Calcium Oxide, Tech.	.70		
1 lb.		Carbon, powdered, Tech. (lampblack)	1.70		
1 lb.		Carbon Disulfide, purified	.95		
1 lb.		Carbon Tetrachloride, Tech.	.70		
1 lb.		Charcoal, wood, lumps	.50		
	1 sq ft.	Copper, Sheet, plain, #20 B & S, Cenco 89085-20	4.00		
5 lb.		Copper Sulfate, Tech., small crystals (available 1 lb. at $.65)	2.50		

* Unit Cost as of January 1961.

Supplies for Seventh, Eighth and Ninth Grade Science

		Supplies (Chemicals) Description	* Unit Cost	On Hand Inventory	To Be Ordered
b.		Detergent, Alconox (3 lb. pkg.)	1.95		
b.		Dextrose, USP	.93		
		Ether, USP	1.37		
b.		Ethyl Acetate, commercial grade (available in 1 gal. bottle at $2.95	1.38		
t.		Fehling's Solution A	1.55		
t.		Fehling's Solution B	1.80		
z.		Gelatine, granulated, Tech.	.60		
b.		Glycerine	1.20		
b.		Formaldehyde, 40% N.F.	.50		
t.		Hilex	.21		
	1	Hydrion Papers with Type A and Type B rolls, double dispenser, Welch	2.00		
t.		Hydrogen Peroxide, 3% solution	.83		
s.		Iodine, USP crystals	1.92		
	1 pkg.	Iron Filings, degreased in sifter, Cenco 78395-2	.85		
	1 sq.ft.	Iron Sheet, mild steel, #28 B & S, Cenco 89205-8	1.25		
		Label Varnish, 8 oz., Cenco 11380-1	1.20		
	1 sq.ft.	Lead Sheet, 1/32" thick, Cenco 89265-2	1.20		
lb.		Lime water (calcium hydroxide solution)	.60		
		Limewater Tablets (bottle of 100), Welch	.60		
als		Litmus Paper, blue (available 12 vials at $1.00)	.12		
als		Litmus Paper, neutral (available 12 vials at $1.00	.12		
als		Litmus Paper, red (available 12 vials at $1.00)	.12		
zs.		Lycopodium Powder	1.00		

nit Cost As of January 1961.

uipment and Supplies for Seventh, Eighth and Ninth Grade Science

ecommended inimum antity hool Room	Supplies (Chemicals) Description	* Unit Cost	On Hand Inventory	To Be Ordered
1 oz.	Magnesium Ribbon	1.88		
1 lb.	Manganese Dioxide, Tech., powder	.70		
5 lb.	Mercury Metal, Tech. (available 5 lbs. at $34.00)	7.05		
4 oz.	Mercuric Oxide, red powder, purified	3.95		
1 lb.	Molasses	.21		
1 lb.	Paraffin (Parowax)	.25		
1 lb.	Petrolatum, yellow	.50		
3 oz.	Phenolphthalein, solution	1.70		
4 oz.	Phosphorous, red amorphous, powdered	2.24		
1 lb.	Potassium Chlorate, N.F.	1.26		
1 lb.	Potassium Iodide, U.S.P., crystals	4.61		
4 oz.	Potassium Permanganate, U.S.P. (available in 1 lb. bottle at $1.70)	.90		
1 oz.	Rennin Powder (available at grocery as "Junket", colored, at $.14)	1.30		
4 oz.	Silver Nitrate, C.P.	5.96		
1 qt.	Soap, green, liquid	.54		
1 lb.	Sodium Bicarbonate, U.S.P., powder (available 5 lbs. at $2.10)	.78		
5 lb.	Sodium Chloride, fine white, Tech.	1.00		
1 lb.	Sodium Hydroxide, U.S.P., pellets	1.01		
1 lb.	Sodium Nitrate, Tech., granular (available 5 lbs. at $1.35	.50		
1 lb.	Steel Wool, medium No. 1	.50		
1 lb.	Starch, Corn	.17		

* Unit Cost as of January 1961.

Recommended Minimum Quantity		Supplies (Chemicals) Description	* Unit Cost	On Hand Inventory	To Be Ordered
School	Room				
2 lb.	2 lb.	Sugar, Cane	.29		
1 lb.	1 lb.	Sulfur, Roll, lump	.50		
2 lb.	1 lb.	Sulfur, Flowers, powder	.50		
[illegible]	1 lb.	Zinc, Metal, mossy, Tech.	.85		
—	3 sq. ft.	Zinc Sheet, 1/32" thick, Cenco 89462	1.25		

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* Unit Cost as of January 1961.

Recommended Minimum Quantity School	Room	Supplies (Consumable) Description	* Unit Cost	On Hand Inventory	To Be Ordered
	1	Aquarium Sealer, Wil-nes (tube of asphaltum-base liquid cement). Bd. of Ed., Educational Supplies	.30		
1 box		Candles, paraffin (12 to box), 7/8" x 4-3/4", Cenco 86505	.48		
	1 box	Cheesecloth (70 yds. to box), 36" wide, Cenco 12280-3	13.50		
	1 hank	Cord, Shade, common, #4, (48 ft. hank), Bd. of Ed., Educational Supplies, Code 266	.25		
1 pkg.		Cotton, absorbent, unsterile (1 lb. to pkg.), Cenco 12522	.95		
	6	Dry Cell, Eveready, No. 6, Bd. of Ed., Educational Supplies, Code 266	.67		
100		Electric Motor Kit ; S. W. Moore, Inc., 100 Beaver Street, Waltham, Mass.	.11		
50 lb.		Fertilizer, Vigoro, Danish Seed Co., Mpls.	1.00 /50 lb.		
	1 pkg.	Filter Paper, 12.5 cm (100 to pkg.), Cenco 13250	.48		
12 boxes		Fishfood, natural, Trans-Mississippi Biological Supply	.10		
1 cu. yard		Gravel, ½" to 3/4", washed, Crown Sidewalk	4.25		
1 bottle		Insecticide, Black Leaf-40, 2 oz., Danish Seed Co.	.96		
	1 box	Labels, 64 x 10 mm, #201 (box of 25), Cenco 16985	.16		
	1 box	Lamps, incandescent, miniature, tungsten filament, 2.5 volts (10 to box), Cenco 86420.1	2.50		
	1 pr.	Magnet, Bar, [illegible], 70 x 8 x 4 mm, Cenco 78315	1.30		
	1 pkg.	Needles, #6 Sharps Sewing (20 in pkg.), Bd. of Ed., Educational Supplies	.055		

* Unit Cost as of January 1961.

ecommended inimum ntity --		Supplies (Consumable) Description	* Unit Cost	On Hand Inventory	To Be Ordered
hool	Room				
	2 cans	Paint, enamel, aluminum, spray, Japalac (16 oz. cans , instant spray in pressurized cans), Bd. of Ed., Educational Supplies	.93		
	2 cans	Paint, enamel, empire green, spray, Japalac (16 oz. cans , instant spray in pressurized cans), Bd. of Ed., Educational Supplies	.93		
	2 cans	Paint, enamel, flat blac., spray, Japalac (16 oz. cans , instant spray in pressurized cans), Bd. of Ed., Educational Supplies	.93		
	2 cans	Paint, enamel, ultra white, spray, Japalac (16 oz. cans , instant spray in pressurized cans) Bd. of Ed., Educational Supplies	.93		
	2 cans	Paint, enamel, vermillion, spray, Japalac (16 oz. cans, instant spray in pressurized cans), Bd. of Ed., Educational Supplies	.93		
	1	Paper, tablets, tracing, 9" x 12", Bd. of Ed., Educational Supplies	.20		
	1 pkg.	Paper, blueprint, 8" x 10" (24 sheets in pkg.), #88482B, Bd. of Ed., Educational Supplies	1.30		
4 bu.		Prepared Potting Soil, sterilized, Bachman's Nursery	3.50 /bu.		
50 lb.		Purina Laboratory Chow, Purina Mills, Mpls.	4.85 /50 lb.		
	2 pkg.	Razor Blades, single edge (10 in dispenser), Gem, Bd. of Ed., Educational Supplies	.41		
	1 pkg.	Rubber Balloons (12 to pkg.), Cenco 18040	.32		
	1 pkg.	Rubber Dam, 12" sq., Cenco 18095-1	.50		
5 sacks		Sand, washed, request through chief engineer	NC		
	12	Sandpaper, #2/0, finishing, 100 grit, Bd. of Ed., Educational Supplies	.027		
	12	Sandpaper, #5/0, finishing, 220 grit, Bd. of Ed., Educational Supplies	.027		
	12	Sandpaper, #00, cabinet, 100 grit, Bd. of Ed., Educational Supplies	.044		

Unit Cost as of January [illegible]

Recommended Minimum Quantity -- School	Room	Supplies (Consumable) Description	* Unit Cost	On Hand Inventory	To Be Ordered
	1 pkg.	Silicone Lens Paper (200 sheets per pkg.), 3" x 6", Welch 8351C	.39		
	6 oz.	Silk Pins	.65 /6 oz.		
	1 lb.	Solder, wire, #10, 50-50, Bd. of Ed., Educational Supplies	.73		
	1	Soldering Paste, 2 oz. can, Bd. of Ed., Educational Supplies	.18		
	2 spls.	Thread, No. 10 black (250 yds.), Sears Roebuck	.29		
	2 spls.	Thread, No. 10 white (250 yds.), Sears Roebuck	.29		
12 boxes		Turtle Food, Trans-Mississippi Biological Supply	.15		
25 lbs		Vermiculite (in 5 lb. bags), Bd. of Ed., Education Supplies, Code 221	.17 /5 lb.		
	1 lb.	Wire, copper, annunciator wire, #18 B &S, Cenco 89540-18	2.10		
100 ft.		Wire, Extension Cord, copper, rubber covered, No. 18, Bd. of Ed., Maintenance Supplies	.042 /ft.		
	1 pkg.	Wood Splints (500 to pkg.), Cenco 12670	.6		

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5-17-63

* Unit Cost as of January 1961

Recommended Minimum Quantity -- School Room	Supplies (Office) Description	* Unit Cost	On Hand Inventory	To Be Ordered
1 box	Chalk, blackboard and art work, assorted colors, Amberite, $\frac{3}{8}$" thick x $3\frac{1}{4}$" long (12 pieces in box), Bd. of Ed., Educational Supplies	.24		
1 box	Chalk, blackboard and art work, "Freart" #1536, assorted colors, 1" thick x 4" long (12 pieces in box), Bd. of Ed., Educational Supplies	.95		
1 can	Cement, Rubber, pint can, Bd. of Ed., Educational Supplies	.40		
4	Sponge , cellulose, medium grain, 1-1/3" x 3-2/3" x 5-1/8", #6, Bd. of Ed., Maintenance Supplies	.098		
1	Tape, masking, architect's, 60 yd., $\frac{1}{2}$" wide, Bd. of Ed., Educational Supplies, Code 209	.65		
2	Tape, Scotch, clear, $\frac{1}{2}$" x 800", #175, Bd. of Ed., Educational Supplies, Code 209	.20		
1 can	Thinner, for rubber cement, 8 oz. can, Bd. of Ed., Educational Supplies	.24		

Minneapolis Public Schools
Science Department
2-20-61

* Unit Cost as of January 1961.

MINNEAPOLIS PUBLIC SCHOOLS
Science Department

SUPPLIERS OF SCIENCE EQUIPMENT AND MATERIALS AND THEIR REPRESENTATIVES

Aloe, Division of Brunswick Corp.
3501 Raleigh Avenue
Minneapolis, Minnesota 55416
927-7351
Rep. A.C. Rink

American Optical Company
2616 Nicollet Avenue
Minneapolis, Minnesota 55408
823-8261
Rep. Bob Anderson

Bausch & Lomb Optical Co.
27 North 4th Street
Minneapolis, Minnesota 55401
335-5195
Rep. George Winikates
335-8788

Becton, Dickinson & Co.
Rutherford, New Jersey
Rep. Herbert S. O'Connor
Lakeview Terrace
Waconia, Minnesota 55387

Bower and Haack Microscope Service
Benjamin Haack, Manager
1826 Como S. E.
Minneapolis, Minnesota 55414
331-5791

Braun Mfg. Co.
Midget Incubators
Box 274
Chatham, New Jersey 07928

Carolina Biological Supply Co.
Burlington, North Carolina 27216
No local representative

Central Scientific Company (Cenco)
Bob Bieser, V. Pres.
1700 Irving Park Road
Chicago, Illinois 60613
Rep. Ed Lang

Chicago Scientific Corp.
Laboratory Apparatus and Chemicals
7319 Vincennes Avenue
Chicago Illinois 60607
Attn.: E.C. Lieber

Corning Glass Works
Laboratory Products Inc.
Corning, New York 14830
Rep. Timothy V. Hartnett
514 Grand Avenue
St. Paul, Minnesota 55102
227-2369

Creative Educational Society
Box 589
Mankato, Minnesota 56001
Rep. Fred E. Wheeler
3609 Aldrich Avenue So.
Minneapolis, Minnesota 55409
822-5664

Denoyer-Geppert Company
5235 Ravenswood Avenue
Chicago, Illinois 60640
Rep. T. H. Kjorlaug
201 Milbert Road
Minneapolis, Minnesota 55426
545-5990

Doerr Glass Company
Vineland, New Jersey 08360
Rep. Richard Wheeler
2086 Iglehart Avenue
St. Paul, Minnesota 55105
645-8746

Eckert Mineral Research, Inc.
110 East Main Street
Florence, Colorado 81226
No local representative

Edison Scott Squire Co., Inc.
New Richmond, Wisconsin 54017
No local representative

Elgeet Optical Company, Inc.
303 Child Street
Rochester, New York 14611
No local representative

Farmer Seed and Nursery Co.
4631 Excelsior Blvd.
Minneapolis, Minnesota 55416
920-1733

Faust Scientific Supply Company
5108 Gordon Avenue
(Biology material only)
Madison, Wisconsin 53716

Foam Plastics, Inc.
17 Southwest Third Street
Osseo, Minnesota 55369
425-4224

General Biological Supply (Turtox)
8200 South Hoyne Avenue
Chicago, Illinois 60620
No local representative

General Science Service Company
Rep. Chester Newby
3450 Yosemite Avenue
P.O. Box 8423
Minneapolis, Minnesota 55426
929-2385

The Industrial & Scientific Instrument Co.
5225 Germantown Avenue
Philadelphia, Pennsylvania 19144
No local representative

Arthur S. LaPine & Co.
6001 South Knox Avenue
Chicago, Illinois 60629

Macalester Scientific Corp.
Joseph Hart
253 Norfolk Street
Cambridge, Massachusetts 02139
No local representative
(New Sales & Services Facilities)
Rep. Thomas F. Shea
215 Burlington Street
Western Springs, Illinois 60558
(312) 246-6070

A.J. Nystrom Company
3333 Elston Avenue
Chicago, Illinois 60618
Rep. Ed Hurley
5209 Mirror Lake Drive
929-4958

Physicians & Hospitals Supply Co.
1400 Harmon Place
Minneapolis, Minnesota 55403
333-5251
Rep. Merlin F. Peterson

Pioneer Plastics, Inc.
8321 Atlantic Blvd.
Jacksonville, Florida 32211

E.H. Sargent & Company
4647 West Foster Avenue
Chicago, Illinois 60630
(312) 777-2700
Rep. Merle T. Nelson
5746 Harriet Avenue
Minneapolis, Minnesota 55419
(612) 823-3301

Schaak Electronics Inc.
3867 Minnehaha Avenue So.
Minneapolis, Minnesota 55406
729-8382

Science Associates
P.O. Box 216
194 Nassau Street
Princeton, New Jersey 08540
No local representative

Science Electronics, Inc. (Linco)
195 Massachusetts Avenue
Cambridge, Massachusetts 02139
(Formerly Lincoln Apparatus, LINCO)
(for PSSC physics)
Rep. Terrence McGann (SIGNAL SYSTEMS)
340 East Franklin Avenue
Minneapolis, Minnesota 55404
339-9195

Scientific Products
3846 Washington Avenue North
Minneapolis, Minnesota 55412
529-7735
(Division of American Hospital Supply Corp.)
Rep. Roy Sternard
788-3371
City Desk - Richard Marty

Stansi Scientific Company
1231 North Honore Street
Chicago, Illinois 60622
No local representative

E. G. Steinhilber & Co., Inc.
102 Josslyn Street
Oshkosh, Wisconsin 54901
No local representative

Trans-Mississippi Biological Supply
892 West County Road B
St. Paul, Minnesota 55113
489-5259
Rep. B.L. Hawkins
(afternoons -
646-4843, Station 254)

Viking Safety & Supply Division
2474 Territorial Road (Safety glasses)
St. Paul, Minnesota 55114
646-3744

George T. Walker & Co.
2218 University Avenue S.E.
Minneapolis, Minnesota 55415
333-3343 - City Desk (Ed Sears or Gordon Danielson)
Rep. Charles L. Howe
6104 11th Avenue South
Minneapolis, Minnesota 55417
869-2348

Ward's Natural Science Establishment, Inc..
P.O. Box 1712
Rochester, New York 14603
No local representative

W. M. Welch Scientific Company
7300 N. Linder Avenue
Skokie, Illinois 60076
Rep. Chester L. Nightengale
Box 473
Alexandria, Minnesota 56308

Wilkens-Anderson Company
4525 W. Division Street
Chicago, Illinois 60651
Rep. James Ramseth
4525 W. Division Street
Chicago, Illinois 60651

Wright's Mineral Service Inc.
3207 Cedar Avenue
Minneapolis, Minnesota
722-9677 (Anderson's)
Rep. Erdis Wright
9612 Chicago Avenue South
Minneapolis, Minnesota 55420
881-0032

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